U.S. INFORMATION SERVICES
VERTICAL MARKETS, 1986-1991
TELECOMMUNICATIONS SECTOR

OCTOBER 1986

INFORMATION SERVICES VERTICAL MARKETS, 1986-1991
TELECOMMUNICATIONS SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- The breakup of AT&T continues to create upheaval in this segment, with new network services and new players creating additional information services opportunities.

- Lowering costs of long-haul communications and the growing importance of linkages have led to increasing traffic volumes domestically and internationally. This, in turn, has led to the requirement for tools to plan and manage new communications channels such as satellites, fiber optics, and new types of data networks.

- The industry continues to change. Merger and acquisition consolidations and new technology and deregulatory actions are creating both chaos and opportunity for participating information services vendors.

B. DEFINITIONS

- The telecommunications market is a diverse one. This analysis and forecast focuses on the needs of AT&T, the Bell Operating Companies (BOCs), independent local exchange carriers (LECs), the long-distance interexchange carriers (IXCs), long-distance resellers, and cellular telephone operators.

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- Currently excluded from the analysis, but included in the forecast, are the broadcasting and cable television industries, fiber optic and satellite networks, and the domestic operations of the international record carriers.

- A distinction must be made between industry-specific products and services used by the included entities and similiarly functional offerings used by large corporations managing their own telecommunications facilities. While the general business segment represents an expanded market opportunity, this analysis focuses on the telecommunications industry itself, as opposed to telecommunications users in other industries.

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II MARKET FORECASTS

- Sales of industry-specific services to the telecommunications industry will total $717 million in 1986 and will grow to $1,929 million in 1991, as shown in Exhibit II-1. This represents an average annual growth rate (AAGR) of 22% and is largely driven by industry needs to plan, implement, and manage new services.

A. PROCESSING SERVICES

- Processing services of all forms represent a $414 million market in 1986 and will grow at an AAGR of 18% to a $960 million market by 1991 (see Exhibits II-1 and II-2).

- Processing services in the telecommunications sector take two principal forms--billing and management.

1. BILLING

- The FCC has decided to detariff interstate billing and collections effective January 1, 1987. With requests for reconsideration to allow time to determine the appropriate costing methodology, that date may be delayed.

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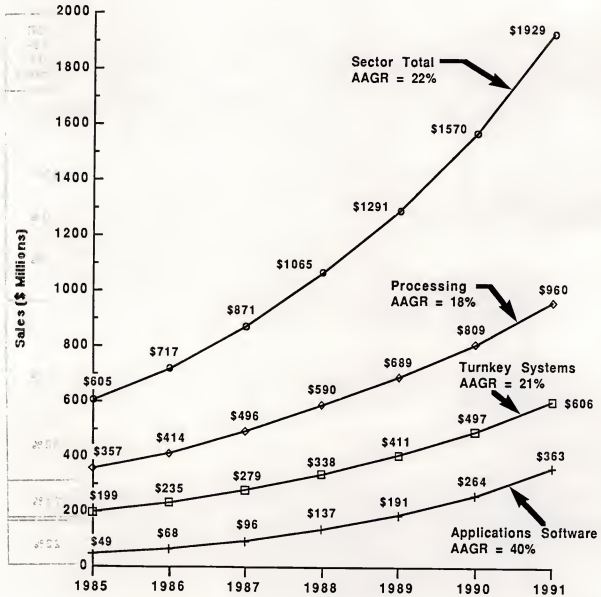
EXHIBIT II-1

TELECOMMUNICATIONS SECTOR
INDUSTRY SPECIFIC EXPENDITURES



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TELECOMMUNICATIONS SECTOR
INDUSTRY-SPECIFIC USER EXPENDITURE FORECAST, 1985-1991
($ MILLIONS)

SEGMENTATION BY DELIVERY MODE	1985	1985-1986 Growth (Percent)	1986	1987	1988	1989	1990	1991	AAGR 1986-1991 (Percent)
Processing Services									
Remote Comp/Batch	$340	16%	$394	$473	$558	$652	$766	$910	18%
Facility Management	17	18%	20	23	32	37	43	50	20%
Total Processing Services	$357	16%	$414	$496	$590	$689	$809	$960	18%
Applications Software									
Mainframe/ Mini	$ 42	36%	$ 57	$ 81	$113	$156	$213	$287	38%
Micro	7	57%	11	15	24	35	51	76	47%
Total Applications Software	$ 49	39%	$ 68	$ 96	$137	$191	$264	$363	40%
Turnkey Systems	$199	18%	$235	$279	$338	$411	$497	$606	21%
Sector Total	$605	19%	$717	$871	$1,065	$1,291	$1,570	$1,929	22%

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- The largest portion of telecommunications billing, that required by AT&T, is not available to independent vendors.

  - AT&T is taking over its own billing services, for which it pays close to $2 billion per year. This means that with a few exceptions (principally independent, i.e., not former Bell System companies, cellular long-distance, and low usage customers), the BOCs which previously provided such services to AT&T will be examining ways to fill newly available capacity.

  - Some of this capacity will be taken up as telephone companies move users from flat, fixed rates to measured services, which are billed on an actual usage basis, thus increasing billing data records.

  - It is likely BOC billing services will be offered to the smaller independent telcos now using regional processing or manual systems. Many, however, are installing turnkey systems, representing a turnkey vendor opportunity.

  - AT&T's costs for former Bell System bill processing are excluded from the market sizing. Prior to divestiture, these expenditures were internal, since AT&T owned the Bell Operating Companies (BOCs). After divestiture, the expenditures are considered captive since revenues are not available to independent vendors.

- Contributing to the growth in bill processing is cellular radio (local, long-distance, and "roamer," by which subscribers access services outside their home territory), an increase in long-distance usage, enhanced services, and increasing data communications.

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2. MANAGEMENT

- Two vendors currently dominate the on-line services market for management systems directed at the telecommunications industry--McDonnell Douglas Communications Industry Systems Company, a part of the parent company's Information Services Group, and Comshare.

  - Products in this category include industry-specific inventory tracking, repair and maintenance controls, personnel scheduling, order processing, marketing, and project management.

  - In larger telecommunications companies, these management functions are increasingly being addressed with specialized turnkey systems or with software licensed for internal installation.

  - However, as new projects (such as new consumer- and business-enhanced services, LEC packet data networks, ISDN-related services, and satellite and fiber optic networks) are initiated by existing and emerging entrants, management processing service needs increase, particularly for short-term planning and project management applications which cannot be economically developed or internally installed.

  - Further, as marketing efforts become more critical to telecommunications companies, processing services supporting this function are needed. For example, Control Data's Marksman application is being used by at least one BOC marketing department. IS could not develop a system due to the demands of divestiture and new financial reports required by various regulatory agencies.

3. OTHER PROCESSING SERVICES

- Directory publishing and information systems use data processing, data base management, sales, and publication services. Specialized directories have

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emerged, although some have not been successful, suggesting caution in approaching this area.

- Computer Output Microform (COM) processing services will remain strong among the smaller to mid-range companies in this segment, assisting in reducing massive paper data bases to manageable formats and size. However, turnkey COM systems have become more affordable and will eventually impact third-party services throughout the size range.

- One company (DCC Data Service, Inc. of Washington, D.C.) maintains data bases and special mailing lists on cellular and land mobile telephone services.

- Electronic Data Interchange (EDI) services using the EDX electronic industry standard are just beginning to be used in general and in telecommunications specifically, for computerized electronics equipment and components buying. McDonnell Douglas' EDI-Net is providing such services to Bell Atlantic.

B. TURNKEY SYSTEMS

- Turnkey systems represent one of the largest delivery modes, and while there has been considerable activity in this segment, there is evidence of a crowded market. However, there is also evidence that specialist firms in turnkey systems are adapting to the new environment.

- Turnkey systems represent a $235 million 1986 market, growing at an AAGR of 21%, and are projected to represent a $606 million market by 1991 (see Exhibits II-1 and II-2). Systems capable of handling network management, maintenance, customer services, and responsibilities formerly handled by AT&T are driving turnkey systems growth.

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- Other turnkey systems being sold into this sector include directory assistance, toll positions, inventory, provisioning service/repair bureau systems, and support for enhanced emergency (E911) services.

C. SOFTWARE

- Applications software products, as in most industries, are the fastest growing delivery mode, totaling $68 million in 1986 and growing to $363 million in 1991, for a healthy 40% average annual growth rate (see Exhibits II-1 and II-2).

- Continuing strong performance of applications software is expected due to new services being developed by market participants associated with ISDN and offered for sale to user organizations for planning and managing their installations and new service offerings.

D. PROFESSIONAL SERVICES

- Merger and acquisition activity in the telecommunications industry is leading to professional services opportunities as companies seek to consolidate their networks and systems.

- Divestiture demands and the requirements of regulatory and oversight agencies have placed new burdens on telecommunications companies. Requirements for separate subsidiaries with separate bookkeeping systems will lead to professional services needs to develop sophisticated accounting systems able to handle demands of the new environment.

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- Educational professional services within telecommunications are also significant, with several vendors running formal technical and strategic seminars, creating video presentations, and publishing training documentation. The industry's need for qualified technical professionals remains high, and existing employees need to be retrained in new technologies and new businesses.

- Professional services are analyzed elsewhere in this volume.

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III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- Divestiture has partially fractured the Bell System's formerly monolithic market, creating a number of discrete entities with greater individual purchasing discretion. No longer are the BOCs obligated to Western Electric or other AT&T units for services, systems, or equipment. The marketplace continues to adapt.

B. MERGERS, ACQUSITIONS, AND PARTNERING

- Industry consolidations are inhibiting the market somewhat since fewer companies will exist.
  - However, it is important to distinguish between functional mergers and investment positions.
  - For example, GTE and US Telecom have married their separate long-distance and value-added networks, while IBM has taken equity in MCI without such functional integration.
- The regional operating companies are playing a more important role, but they vary in their approaches and capabilities. Traditional information services

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vendors are finding their former customers becoming vendors themselves and/or entering into alliances to participate in the new market dynamics. In 1986:

- Nynex purchased Telco Research, a provider of corporate user telecommunications management software and systems, and is working to bundle hardware and software systems for user telecommunications functions.

- Nynex has also purchased IBM's national computer and software retail chain, adding to its earlier retail acquisitions.

- Cincinnati Bell Information Systems, already providing a wide range of telco-specialized software, purchased Cellular Business Systems, Inc., a billing and management systems/services firm, and has joined with McDonnell Douglas Information Systems Group and Auxton Computer Enterprises in providing a cellular clearinghouse to bill users placing calls outside their home area ("roamers").

- Southern New England Telephone's statewide packet network, linked to Tymnet, ITT World Communications, and other LEC Local Area Data Transport (LADT) networks, will likely follow this internetworking approach.

C. VENDOR PROFILES

- This section profiles the leading vendors providing processing services, professional services, and software and turnkey systems to the telecommunications industry.

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1. ADVANCED CELLULAR TECHNOLOGIES, INC. (ACTI)

- ACTI, headquartered in Creve Coeur (MO), was formed as a cellular radio clearinghouse designed to authorize and process billing for cellular roamers, i.e., users making calls outside their home system.

- The newly formed company is a joint venture of Auxton Computers, Cincinnati Bell Information Systems, Cellular Business Systems, Inc. (recently purchased by CBIS), and McDonnell Douglas Information Systems Group.

2. AGS COMPUTERS, INC.

- AGS (Mountainside, NJ) provides custom software development, professional services, systems, and applications software for the telecommunications, banking/finance, and computer manufactuuring industries.

- Approximately 25% of AGS' 1985 computer services revenue of $117.4 million was derived from AT&T. AGS employs approximately 2,300.

- AGS Systems Development has provided services to AT&T since 1970 and was engaged in more than 70 AT&T and affiliate projects at the end of 1985. As a result of this association, the unit has a large UNIX consulting staff. Since divestiture, AGS has also supplied UNIX services to other computer companies and large end-user organizations.

3. AMERICAN COMPUTER AND ELECTRONICS CORPORATION

- This Gaithersburg (MD) company primarily provides software and systems, but also operates an RCS for telecommunications departments such as those found in universities.

- The RCS service principally processes call records. Systems are sold to telcos and to telecommunications departments for equipment inventory manage-

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ment, call record processing, automated directories, and plant cable management.

- The company-written software operates on DEC VAX and Texas Instruments hardware.

- The privately-owned company attributes 30% of its revenues to telco sales, 30% to telecommunications departments, 20% to RCS functions, and the balance to consulting services.

4. AMERICAN MANAGEMENT SYSTEMS, INC.

- In 1985, AMS (Arlington, VA) acquired the rights to a software package developed by Pacific Telecom, Inc. for its telephone operating companies and also used by 29 telcos in the Alltel group.

  - The package, called Carrier Access Billing System Plus, has been enhanced with updated tariff information.

  - It is targeted to local telcos to generate reports and handle billing for interexchange carriers accessing local telco networks.

- For ten years, AMS has been providing systems development and support services for MCI in order processing, billing, accounts receivable, and collections.

- The company provides services and software to this segment as well as financial services institutions, government agencies, and utilities.

- AMS reported 1985 revenues of $112.2 million, with $3.1 million from the telecommunications industry. It has established a revenue growth goal of 15-20% annually.

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- One part of AMS' strategy is to work contractually and jointly with clients in software development projects.

5. APPLIED COMPUTING DEVICES, INC.

- This privately held Terre Haute (IN) company provides operational data support systems with surveillance and control functions, bill processing services, and turnkey systems for directory assistance, inventory control, maintenance, and traffic information management systems.

- Customers include telcos, other common carriers (MCI), and EDS.

- The company was formed in 1974, employs approximately 150, and had estimated 1985 revenues of $11 million.

- The Indiana Center for Telecommunications Technology is a subsidiary involved in custom research and development.

6. AT&T NETWORK SYSTEMS

- This group is responsible for the design, manufacture, marketing, engineering, and installation of telecommunications networking equipment, much of which incorporates software.

- Major customers include Regional Bell Operating Companies, AT&T Communications, independent telcos, non-Bell cellular telephone companies, and other common carriers, both domestic and international.

- Equipment offered with supporting software includes:

  - Central office switches such as the 5ESS, Centrex systems, and Business and Residential Custom Service packages.

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- The ACORN Network Control System.

- The Billdats data collection system providing automated bill data collection in association with central office equipment.

  . Configured on an AT&T 3B20 or 3B5 UNIX computer, the system automatically transmits billing information from up to 36 central offices (24 simultaneously) to a central customer billing center or to a billing service, eliminating physical transporation of computer tapes.

  . The data is placed on disk storage, processed, and transferred to computer tapes in the standard Automatic Message Accounting Standard Entry (AMASE) format used by most billing computers.

  . According to AT&T, the system can work with almost any central office switch, including non-AT&T equipment.

  . The format of the billing data will reportedly accommodate future calling features. The system is modular and can grow with billing data volume.

- Professional services include systems equipment engineering, installation, maintenance, and remote diagnostics.

7. AUXTON COMPUTER ENTERPRISES COMPANY (AUXCO)

- AUXCO (Maitland, FL), formed in 1969, specializes in services and systems for the telecommunications industry.

- In addition to management consulting and customized software, the firm offers processing services for long-distance carriers, resellers, cellular operators, and paging services.

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- Compu-Network provides calculation of service charges, billing, adjustments, and customer records maintenance as well as payment processing and collections, with credit information integrated into the customer data base. Volume or percentage discounts can be calculated.

- Compu-Cellular handles similiar functions, includes order processing, repair tracking, and inventory management, and can provide market analysis information.

- The company is also developing software for a planned cellular clearinghouse for roaming applications and is participating with Cincinnati Bell Information Systems and others in forming such a clearinghouse.

- In late 1986, AUXCO announced agreement with AT&T Communications to provide processing services for long-distance toll calls placed by cellular users under equal access rules. Services covered include toll rating, billing, collections, toll investigations, and customer inquiry services.

- AUXCO software available for customer IBM processors includes:

  - Socrates (Service Order Customer Record and Terminal Entry System).

  - LUCAS (Line Utilization Cable Assignment System) for data conversion to create the facility's data base, service order processing, cable throw information, repair processing, inquiry support, and management reports.

  - COEI (Central Office Equipment Inventory), providing telephone number and frame management.

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- EWO (Engineering Work Order) for inventory information of outside plant cable.

- The company is currently processing for more than 14 cellular companies, including the subsidiaries of Bell South, Southwestern Bell, Contel, Pacific Telesis, United Telecommunications, and others representing more than 34 systems. The company claims nearly half of the wireline (i.e., LEC affiliated) cellular processing business.

- Other clients include long-distance resellers for billing and processing services.

- The company sees its cellular expertise as a principal strength along with service and product quality.

- AUXCO reported 1985 revenues of $28 million, with 65% derived from professional services consulting, 23% from processing services, and 12% from applications software products sold to the telecommunications industry. It employs approximately 385.

- Revenue for the three months ending March 31, 1986 was $7.7 million, a 19% increase over the same quarter in 1985.

- AUXCO is currently developing a software package to support the administration and operation of private networks. The package is targeted to Fortune 500 companies, the military, universities, and other large organizations. Beta testing is expected to begin in January 1987.

8. BANK OF ILLINOIS

- The Champaign (IL) bank operates a data center which provides processing services to telecommunications and other entities.

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- Regional independent telephone companies and cellular operators currently use its billing and other services.

- The bank sees its major competitive strength as its stability. Backed by a financial institution, it is able to expand without needing external resources.

- It also competes based on price and service. For example, to schedule the necessary programming changes, bank personnel work with cellular marketing departments to provide insight into the data processing required due to service pricing changes.

9. BELL COMMUNICATIONS RESEARCH (BELLCORE)

- Bellcore was formed from AT&T's Central Services Organization (CSO) after divestiture to provide technical and other support to the Bell Operating Companies and their regional affiliates. Each of the seven RBOCs own a share of Bellcore. The company also participates in international standards forums and administers the North American Numbering Plan.

- Among the professional services provided are applied research in evolving technologies, ISDN and other new services planning, software, documentation, training, and field support.

- Bellcore is a leading provider of telecommunications software to the BOCs, supporting over a hundred individual systems from large mainframe programs to microcomputer applications.

- A catalog of software, documentation, and training materials (called "intellectual properties") is maintained by Bellcore; the software is available for licensing.

- Under the Modified Final Judgement (which led to divestiture), Bellcore is permitted to develop software products for its customers (i.e., the RBOCs) but cannot manufacture or market hardware.

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- Software is available covering the full scope of BOC activities including:

  - Cost and financial analysis, including software to prepare tariff rate changes and other regulatory agency reports.

  - Customer services, including marketing tools, order entry, inquiry, tracking, and control.

  - Network planning and engineering, including network configuration, loading analysis, and forecasting.

  - Provisioning, covering inventory, equipment and facilities assignment, circuit design, and personnel management.

  - Development and testing tools.

10. BELLSOUTH

- This RBOC was granted a waiver to market proprietary software previously used internally.

  - BellSouth Services, Inc. sells the modular Current system for handling telephone service orders, billing, maintenance, and inventory.

  - Also available is the Telecommunications Information Processing Software System (TIPSS) with modules for on-line directories, call accounting, inventory management, and shared tenant or corporate telecommunications services.

- Both sets of products are targeted to large companies managing their own networks.

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- BellSouth Services also offers the E911 SALI (for Enhanced 911 Standalone Automatic Location Idenfication) software system providing emergency call functions to small municipalities. This system identifies the number and address of the calling party for emergency responses.

II. CINCINNATI BELL INFORMATION SYSTEMS, INC. (CBIS)

- CBIS (Cincinnati, OH) provides telecommunications software and services to BOCs, independents, and offshore telecom companies for billing and outside plant management, and has ventured into processing services with a cellular radio offering.

- Among its software products and services are:

  - Customer Records Information System (CRIS) for customer billing and recordkeeping.

  - A customer order entry and distribution system (OS/ORDER) providing interactive on-line entry, correction, and updating.

  - Message Processing System (MPS), a consolidated toll message and usage billing system which can handle all types of services, including access charges, mobile and cellular service, WATS, coin service, and local service.

  - A mechanized exchange customer cable record system (OS/PLANT) for outside plant administration.

  - Centralized Online Customer Records Information System (COCRIS) for customer inquiry, adjustments, service denial/restoration orders, and other related tasks.

  - A construction force management system (OS/FORCE-PLUS).

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- Cellware, an integrated cellular message processing, account management, and customer billing system for cellular operators and resellers which rates calls and supports other on-line features such as order entry, bill adjustments, and management reporting.

- Cincinatti Bell is CBIS' primary telco user, along with AT&T Communications, for Megacom billing, a WATS-type service, and other new services.

- CBIS has acquired several entities to bolster its service and software offerings. For example:

  - Cellular Business Systems, Inc. (CBSI - Park Ridge, IL), was acquired in 1986 as a division of CBIS.

    . CBSI's professional and processing services and software support a variety of industry-specific applications such as customer data base and telephone number management, call rating and billing, charge reconciliation, and billing for car rental cellular services.

    . The combined companies provide billing services in most of the top 30 cellular markets, billing in excess of 200,000 cellular users.

    . CBIS, its new CBSI division, Auxton Computer, and McDonnell Douglas Information Systems Group have formed a cellular clearinghouse headquartered in Creve Coeur (MO) called Advanced Cellular Technologies, Inc.

  - Creative Management Systems, Inc. (McLean, VA), a designer of telephone call accounting software systems, was acquired in 1985.

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- CBIS has also purchased the Commtrack unit of United Information Services. UIS (Overland Park, KS), once part of United Telecommunications, was sold to Control Data Corporation in 1983. Commtrack's services are used by large telecommunications users, resellers, two independent telcos, and two BOCs for internal Station Message Detail Recording (SMDR).

12. COMPUTER CONSOLES, INC. (CCI)

- CCI, a major provider of turnkey systems, experienced declining revenues in 1985, attributed to various factors including overly optimistic sales projections, inadequate marketing resources to support diversification efforts, and organizational and internal communications problems.

  - After 10 years of steady growth, revenues declined 15% from $131.2 million to $111.9 million, representing a net loss of $41.9 million.

  - However, CCI is making progress with a return to profitability expected in 1986 due to new marketing strategies, cost control measures, restructuring, and new management.

- CCI has cut its workforce and now employs approximately 1,200. Development and manufacturing are being geographically consolidated and product development is being downscaled.

- The company is expanding its focus from the telephone industry to integrated office systems, which will be sold along with other large customized turnkey systems to telcos, the federal government, and special vertical markets such as law firms.

- In late 1986, CCI announced a development agreement for an interface between CCI's directory assistance/enhanced listing services data base and Northern Telecom's digital central office switches supporting the Traffic Operator Position System (TOPS).

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- The agreement, said to be the first between a directory assistance data base supplier and a digital switch maker, is expected to result in development of a system enabling telcos to handle both information and toll/operator assistance calls simultaneously.

- In addition to information and toll calls, Northern Telecom's "univeral service position," competitive with a U.S. West product, enables an operator to handle access to electronic yellow pages, automated list services, nonpublished call back, and message delivery services.

13. COMPUTER HORIZIONS CORPORATION (CHC)

- This New York-based firm is primarily involved in custom software analysis and design and programming services to the communications industry as well as other industries.

- Fiscal 1985 (year ending February 28, 1985) results show that an estimated 46% of the company's operating revenue of $44.4 million was derived from the communications industry, with the company maintaining a compound annual growth rate in revenues of 35%.

- Fiscal 1986 results show revenues of $50.9 million (a 15% increase), with only modest growth (to 43% of total revenue) reported in the communications sector primarily due to a business downturn in the Orlando AT&T IS operation and also due to continuing pricing pressure from clients.

- CHC is diversifying into other areas due to slowed growth in the communications segment while maintaining its long-term relationships with AT&T and the divested BOCs.

- The company's future strategy is to leverage its communications and financial segment experience in new markets such as utilities, defense, and manufac-

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turing, where it has experienced its fastest growth rates over the past two years.

- Projects in 1984 included design and development services for various aspects of new telephone billing systems created by AT&T's reorganization as well as other administrative and financial information systems.

  - However, AT&T's internal consolidation efforts have affected CHC's business.

  - AT&T administrative offices have been closed, and AT&T asked for volume discounts from its vendors. AT&T's need for services is expected to continue growing despite these measures.

14. COMPUTER SCIENCES CORPORATION (CSC)

- In late 1983, CSC (El Segundo, CA) was awarded a five-year contract, with an estimated value of $30 million, to continue maintenance and enhancement work on what it calls "the largest applications system in commercial use" for AT&T Communications. The Trunks Integrated Records Keeping System (TIRKS) automates provision and planning management of telephone circuits, facilities, and equipment.

- TIRKS incorporates more than 350 data bases and over 18,000 software modules.

15. COMSHARE, INC.

- Comshare (Ann Arbor, MI), founded in 1966, is one of the earliest companies to offer commercial timesharing services.

- While processing services are still a major business, the company has enacted a new decision support strategy (DSS).

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- Comshare specializes in several RCS markets, including telecommunications, human resources administration, and data base management systems.

- The telecommunications industry applications are called 4.1.1. They include an integrated system for telcos to control administrative activities such as telephone number assignments and voice traffic load balancing.

- Comshare recognizes that the deregulation of AT&T has opened additional markets in selling this type of service to independent telephone companies. Also, Comshare has found new customers for System W, an integrated DSS mainframe and micro product. System W combines business reporting, modeling, forecasting, statistical analysis, spreadsheets, data management, graphics, communications, and interfaces for data acquisition for external software products.

- The principal 4.1.1. product is MIDAS (Mechanized Dial Assignment), which changes office records when a service order is written and dynamically recalculates load balance when equipment or circuits are added or removed from service. On-line status reporting is provided, among other capabilities.

- Incorporated in MIDAS are several modules for equipment balancing as well as modules to support analog-to-digital central office switch conversions and translations, to manage the main distribution frame, and to manage outside plants.

- All applications are available through remote computing and can be licensed for IBM MVS environments.

- The company sells a single turnkey system for directory assistance which operates on Data General minicomputers.

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- The company sells to all major independent telcos including Contel, GTE, and United companies, several Caribbean telcos, and many smaller domestic telcos including Standard Telephone and Enterprise, for a total of between 25-30 companies.

- Comshare has had difficulty selling into BOC environments because of competitive software products from AT&T and Bell Communications Research (Bellcore) which had previous involvement with the BOCs for these types of applications.

- The company claims 1985 revenues for 4.1.1. products of between $9-10 million. Its major strengths are its software for IBM systems configurable to any central office switch. Its major competitors (AT&T and Bell Communications Research) require telcos to use AT&T or other hardware for software installation, while 4.1.1. products are available both as software or as remote computing services.

- Comshare also has professional services available for large, one-time applications as well as field services for routine consulting and maintenance.

16. DATA ARCHITECTS, INC. (DAI)

- DAI (Waltham, MA) believes the growth in demand for voice and data telecommunications services has led to major communications network expansions by carriers and new requirements for automated support systems to collect billing information, manage switched networks, and market new services.

- In January 1983, GTE Sprint (now U.S. Sprint) awarded DAI a contract to develop and install the Call History Information Processing System, a nationwide network of more than 30 Tandem NonStop computers located at each major voice switching center. The system collects, processes, and relays the records for all toll calls to national centers.

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- In 1985, DAI completed two major business support systems for RBOCs.

  - For U.S. West, it built the SONAR system (Service Order Negotiation and Retrieval) which automates the service order process for ordering phone and line equipment with interfaces to all associated computer system applications such as inventory, billing, customer records, and scheduling.

  - For the British Columbia Telephone Company, it built the NICS (Network Information and Communications System) network management support system, which takes data from 12 different types of voice network switches to help monitor and manage traffic patterns.

  - DAI maintained exclusive marketing rights to the two systems and has a letter of intent with an eastern RBOC to install the SONAR system.

- While 45% of DAI's business comes from the banking industry and 35% from insurance, telecommunications products and services represent 20% (or $4.2 million) of its 1985 revenues of $20,945,000, a 35% increase over 1984.

- Overall, professional services, including consulting and custom system services, accounted for 70%, or $14.7 million, of 1985 revenues.

- DAI's 1985 net income increased 108% to $1.25 million.

- DAI's corporate goal is to become a leading supplier of business applications, primarily to the financial services and telecommunications industries. It expects to double current revenues and increase software product revenues to more than 50% of total revenues by 1990.

- The company sees its consulting and custom work as contributing to its experience with advanced technology, building a staff of technologists and

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managers, and leading to the development of software which can be resold in its target markets.

17. DATACOMP CORPORATION

- This privately held Philadelphia (PA) company is a subsidiary of the Grantz Group, which includes Data National, Dataserv, and TechSouth corporations. It has been in operation since 1971.

- The company provides processing services and software for telcos, primarily for data base management, photocomposition, and display and composition associated with white and yellow page directories.

- Datacomp also writes custom software for BOCs, provides training, and produces turnkey systems for small independent publishing companies. In addition, the company is involved in direct mail and telemarketing with list management services.

- Specific products are:

  - Datatrac, a data base management service order processing system.

  - Page-Graphix for page composition.

  - Contrac, supporting contract and sales management by directory publishers.

- All systems operate on DEC computers.

- The company has introduced a new toll-free directory assistance service available in the Princeton (NJ) area. Called the Yellow Pager, it is supported by advertisers.

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- Revenues for 1985 were $16.2 million, with an estimated 90% derived from processing services, 5% from software, and 5% from professional services (primarily software development). The company has approximately 400 employees.

18. GTE DATA SERVICES (GTEDS)

- This Tampa (FL) data processing subsidiary of GTE performs most of its processing and facilities management work for GTE domestic and overseas telephone companies (i.e., captive processing) through its proprietary SNA network connecting approximately 10 data centers.

- GTEDS also handles long-distance landline and cellular bill processing for AT&T Communications traffic within GTE's territory.

- The company is working to market software and services to other telephone companies and to leverage its experience in data center facilities management for commercial markets beyond telecommunications. GTEDS has approximately 200 employees.

19. MCDONNELL DOUGLAS COMMUNICATIONS INDUSTRY SYSTEMS COMPANY (MDCISC)

- McDonnell Douglas acquired Computer Sharing Services (a division of Rio Grande Industries) of Denver in January 1984 and Tymshare in April 1984. These companys' services were combined with some of McDonnell Douglas' mainframe products and services to form this new company, a part of McDonnell Douglas Automation Information Services Group (ISG) consolidating overlapping products and sales forces.

- The company offers processing services directed to both independent telcos and BOCs. These include adaptations of general services as well as those especially designed for the industry.

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- The Outward Telephone Information System (OTIS) tracks telephone set inventory, movement, and performance.

- The Pricing and Loading system (PAL) assists in managing the repair and maintenance of switching equipment.

- Several facilities administration applications are included in the Management Scheduling and Control System (MSCS), adapted for telephone applications. It is an integrated system for analog to digital switch conversion and is used for other large-scale project management tasks. Modules cover cost planning, materials management and purchasing, personnel scheduling and forecasting, marketing, traffic reporting and measuring, and plant administration.

- MDCISC is the largest processor for the industry outside the former Bell system, with all 22 BOCs, the RBOCs, and AT&T as well as the major independents as customers. The company has managed the equal access balloting system for several of the BOCs to control consumer long-distance service selection.

- McDonnell Douglas is participating with Cincinnati Bell Information Systems and Auxton Computer to develop a cellular telephone clearinghouse.

20. ROCKWELL INTERNATIONAL

- Rockwell's Common Carrier Systems, Switching Systems Division (Downers Grove, IL) markets a digital Service Node with enhanced 911 software. This system routes emergency calls from several central office areas to public safety answering points, regardless of serving area, municipal, or service agency boundaries. The system also forwards automatic number identification data allowing rapid identification of the calling party and location.

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21. TDS COMPUTER SERVICES

- TDS, based in Madison (WI), is a wholly-owned subsidiary of Telephone and Data Systems (TDS), a telephone operating group.

- The company primarily services TDS companies including 70 telcos, 16 CATV firms, and paging and mobile telephone companies throughout the midwestern and eastern states.

- TDS Computer Services claims 1985 revenues of approximately $7 million.

- TDS says it is developing distributed systems; however, in the case of long-distance billing, it sees economies of scale in maintaining centralized processing.

22. U.S. WEST

- This Denver-based RBOC sells telecommunications software for PCs through the Information Systems Division.

- The Knowledge Engineering Division sells an IBM XT-based Multiple Purpose Operator Workstation (MPOW), designed to Bellcore specifications, which is compatible with digital toll switches.

  - MPOW features enhanced graphics and handles toll, directory assistance, and supervisior functions, with access to LAN-based data bases for rate and route information.

  - Because it is a DOS-based system, it will also operate telco-developed applications.

  - The company cites the system's adaptability to changing switches, information, and software as a key benefit over competitive products

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based on minicomputer-hosted dumb terminals. Another benefit is faster response time.

- Systems have been sold to BOCs and independent LECs.

- Landmark, U.S. West's publishing company, has purchased several other telephone directory publishers to expand its directory operations. The company and its subsidiaries publish some 800 telephone and city directories in 42 states.

23. VOLT DELTA RESOURCES, INC.

- This New York City subsidiary of Volt Information Sciences, Inc. (VIS) designs, markets, and maintains customized turnkey systems and provides professional services, custom software development, and consulting for the telecommunications industry. Volt Delta employs approximately 300.

- Fiscal 1985 revenues were $19.7 million, a 42% decrease from 1984, with a net loss of $4.9 million. This decrease was attributed to a reduction in contract work and delays on a major contract. The company plans to broaden its focus beyond its traditional markets.

- The parent firm (VIS) provides technical services, temporary personnel, electronic publication (including typsetting systems), technical publication, and consulting services. It reported fiscal 1985 revenues of $390 million.

- Volt Delta's customized turnkey systems are based on DEC VAX and PDP hardware using proprietary software. These systems are used for printed and electronic telephone directories and directory assistance systems.

- In association with United Telecom, Volt is offering The Information Line in the Kansas City area. This is an information retrieval system enabling an operator to provide callers with information on local business advertisers.

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- Recent custom software consulting projects include enhancements of previously installed electronic directory assistance systems to include automated voice response capability and a yellow- and white-page directory publishing project in support of a subsidiary's production center in Uraguay.

24. OTHERS

- Smaller firms selling to the telecommunications market are:

  - Allied Data, Inc. (Olympia, WA) is owned by U.S. Intelco Networks which, in turn, is owned by 160 independent telephone companies. The company provides processing services and has several software packages called Telco:Allied for billing, general ledger, payroll, customer service, and other related functions.

  - Butler Computer Graphics (Denver, CO) markets the Telephone Data Management System designed for accounting, engineering, and mapping applications related to telco facilities distribution networks. The system runs on Data General MV Series minicomputers.

  - Celltech, Inc. (Houston, TX) sells a billing and account system for cellular, mobile radio, and paging companies and for long-distance resellers.

  - Commercial Software, Inc. (New York, NY) provides several software packages for cost allocation, telecommunications equipment management, on-line inquiries and credit card authorization, trouble reporting, network management, and network optimization and design, primarily for DEC VAX processors, but also provides services to industries other than telecommunications. The private firm had 1985 revenues of approximately $2 million.

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- Commonwealth Communications (Wilkes-Barre, PA) offers a cellular billing service bureau and an internal system for account management and bill generation.

- Communications Software, Inc. (Atlanta, GA) provides turnkey systems for radio common carriers, telephone answering services, and mobile radio companies.

- Computer Generation (Atlanta, GA) is selling a DEC-based system to support measured local services to the Regional Bell Operating Companies.

- Computer Innovations (Chicago, IL) provides professional services, including utility program development, for Bell Labs and GTE. Estimated revenue from telecommunications companies for the privately-held firm is under $1 million.

- ComputerWare, Inc. (Dallas, TX) sells a turnkey system and provides a service bureau for telecommunications facilities recordkeeping. Functions control billing, accounting, order entry, trouble reporting, cable records and other operations.

- ComputoService, Inc. (Mankato, MN) is a processing service owned by the Mankato Telephone Company.

- Computel (Blair, NE) is a processing service affiliated with the Great Plains Telephone Company, which owns several independent telcos in the state and recently acquired the Nebraska holdings of Continental Telephone.

- Comtech Systems, Inc. (Columbus, OH) has performed systems design, analysis, and programming work for AT&T and Bell Labs. Estimated revenue for the privately held firm from telecommunications companies is under $2 million.

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- Datamap, Inc. (Eden Prairie, MN) provides mapping services, primarily for AT&T, to establish standard cellular service mapping and for use in marketing applications. The public firm had 1985 revenues of approximately $.6 million, with approximately 10% derived from telecommunications companies.

- Decision Focus, Inc. (Palo Alto, CA), a private software and professional services firm, developed a pricing model used for preparing rate case submissions and internal pricing studies for Pacific Bell. The company claims 5-10% of its revenue (estimated at $6 million) comes from telecommunications.

- Digital Communications Associates (DCA) (Alpharetta, GA) is best known for its "Irma" micro-mainframe hardware and software links. Its Line Pricer software has been used by several interexchange carriers to calculate rates for voice and data networks. The company also offers network management tools and packet switching interfaces. The company additionally provides professional services, with accounts including Ameritech, Pacific Bell, U.S. West, and the Lincoln Telephone Company as well as overseas telecommunications companies.

- Evans, Griffiths and Hart, Inc. (Lexington, MA) provides software and professional services to the industry as well as other industry sectors. Its products include a package which analyzes service orders by telephone number and a traffic data base for directory assistance. The company has revenues under $2 million, with telecommunications accounting for approximately one-third.

- Geographic Systems, Inc. (Andover, MA) provides marketing software for geographical analysis and forecasting which is used by New England Telephone for planning wire centers and telephone exchange capaci-

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ties. The company also performs professional services, with estimated revenues under $2 million.

- In-Touch Management Systems (Elmont, NY) provides a management system for radio common carriers and telephone answering services.

- Mid-America Computer Corporation (MACC) (Blair, NE) provides billing services and sells a turnkey system. MACC is the national data administrator/billing center for the Air-Ground Radio Automated System (AGRAS) which provides dial-up telephone service to general aviation (private) pilots.

- North Central Data Cooperative (Mandan, ND) is a data processing cooperative servicing member telcos and other independents as well as electric and other rural utility companies. The cooperative sells turnkey systems based on Burroughs processors. Software maintenance and consulting services are also available.

- Performance Systems, Inc. (Rockville, MD) markets a planning package for projecting hardware, software, and network performance used by several telephone companies.

- Progressive Automation and Computer Evaluation, Inc. (Lafayette, IN) has recently introduced a modular, integrated telephone computer management system, dubbed Phase I, for DEC PDP-11 computers.

- Quintrex Data Systems (Cedar Rapids, IA) sells a IBM-based turnkey system designed for small independent telephone companies with 500 to 18,000 subscribers.

- Saztek (Rolling Hills Estates, CA) provides programming, processing, professional services, electronic publishing, and related services. It has developed several telecommunications-specific packages for cable

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status reports, customer records, loop maintenance, and other telco tasks.

- Systemation, Inc. (Cleveland, OH) provides professional services and applications software. It has developed customer billing, toll credit card, network administration, and directory order entry systems for clients such as Ameritech and United Telecommunications. Systemation reported total 1985 revenues of $16.7 million, with $2.4 million from telecommunications work.

- Teknowledge, Inc., a Palo Alto (CA) professional services and software firm, provides educational services and artificial intelligence/expert systems software and development services for diagnostic applications. An estimated $1.25 million of its $6.2 million 1985 revenue was derived from the telecommunications industry.

- Telecalc, Inc., a public (OTC) firm located in Bellevue (WA), has sold a micro-based management information system to Pacific Telesis for use by Pacific Bell and Nevada Bell. The company reported six-month earnings to July 1986 of $1.3 million, with a deficit of $1.24 million, compared to income of over $3 million in the same period during 1985, and net income of $311,000.

- Telecom MIS, Inc. (Upper Darby, PA), recently separated from its parent firm, United Technologies, targets shared tenant services and long-distance resellers.

- Teltone Corporation (Kirkland, WA), a 17-year-old company, provides equipment, engineering services, and application support and offers the Local Measured Service system for electromechanical (i.e., older) central offices. The vendor claims 100 installations.

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- Vistacom (Owings Mill, MD) is an affiliate of long-distance reseller Telesaver. It sells an integrated system called Telcro to resellers for direct billing output.

- Universal Data Processing, Inc. (UDP) (San Antonio, TX), in addition to processing, sells turnkey systems using its own software.

- Exhibits III-1 through III-4 show the leading vendors in the telephony telecommunications segment and their market shares in the entire market and within their primary delivery mode categories.

- As shown in the above profiles, several telephone company subsidiaries as well as Bell Communications Research are now providing software, systems, and services for other telecommunications entities (and for large telecommunications users), creating a heated competitive environment.

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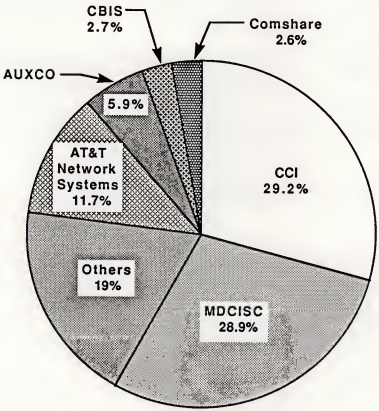
TELECOMMUNICATIONS SECTOR* TOTAL INFORMATION SERVICES MARKET SHARE, 1985



*Telcos, IXCs, Cellular, and Resellers.

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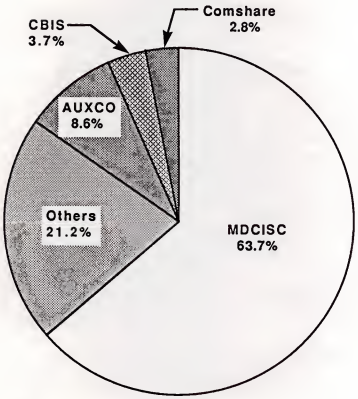
EXHIBIT III-2

TELECOMMUNICATIONS SECTOR* PROCESSING SERVICES MARKET SHARE, 1985



*Telcos, IXCS, Cellular, and Resellers.

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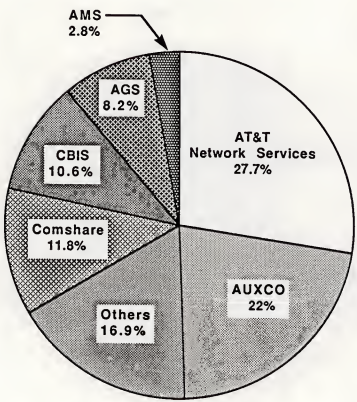
EXHIBIT III-3

TELECOMMUNICATIONS SECTOR NONCAPTIVE SOFTWARE MARKET SHARE, 1985



*Telcos, IXCS, Cellular, and Resellers.

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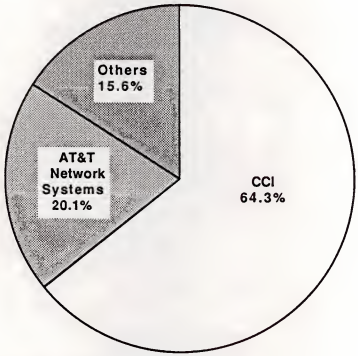
EXHIBIT III-4

TELECOMMUNICATIONS SECTOR*
TURNKEY SYSTEMS
MARKET SHARE, 1985



*Telcos, IXCS, Cellular, and Resellers.

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IV INFORMATION SYSTEMS DEPARTMENT OUTLOOK

- An industry association's research found telecommunications companies realizing revenue increases of 7.6% between March 1985 and March 1986 while employment dropped over 6%. Increased productivity per employee is due in part to the use of automated systems.

- However, INPUT's research found that in most cases, the IS department is expected to grow to meet increasing demands, although in the longer term, new technologies are expected to reduce personnel needs. In addition to larger staffs, higher IS budgets are being requested due to increasing vendor costs.

- In some cases, IS departments at telecommunications entities have been overloaded due to the demands of divestiture, a more competitive environment, and regulatory agency requirements for accurately reported data.

- This has sometimes led units within the company to seek independent solutions to departmental problems. For example, the marketing department of one BOC signed with a computer services vendor for a marketing application which incorporates vendor software on a minicomputer tied to the remote computing service for additional capabilities.

- Not surprisingly, all telecommunications companies interviewed identified deregulation and divestiture as the two key drivers of change within the industry. Deregulation has led to more competition. As one respondent said,

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"We have to get out there and hustle for customers." Furthermore, IS is being asked by the marketing department for more customer information to identify prospects for new services and for planning purposes.

- In addition to reducing staffing needs, new technologies are being investigated to permit telecommunications companies to provide not just better but more rapid service to customers. The threat of more flexible competitors is changing attitudes in the formerly monopolistic environment.

- IS departments reported that management of their own, internal telecommunications systems and incorporating all media--voice, data, facsimile, and video--has become more important. This is an indicator of the continuing merger of voice and data responsibilities into one department, although there is a question about the amount of voice/data integration that will actually take place.

- Respondents report looking to companies outside the industry to identify models for using information services to competitive advantage.

- Several users indicated that vendors have yet to adequately adopt standards to accommodate an open systems environment.

- New applications being implemented include billing and toll systems to replace outdated ones.

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V NEW OPPORTUNITIES

- One challenge facing BOC-affiliated vendors is to secure business with other industry companies who may consider the vendor a rival.

  - This factor is a market inhibitor, based on both emotional and business grounds, which translates into opportunity for independent firms, at least in the near term.

  - Partnering with or acquisition of independents may be colored by the affiliation. It is uncertain if such alliances will be beneficial or detrimental to the parties involved in attempts to sell in the telecommunications environment.

  - However, the motivation for such partnering is usually to enter broader information service markets, not merely telecommunications itself, in which case benefits accrue by providing the BOC partners with the ability to provide software and services to their customers, becoming a one-stop source of IS solutions.

- INPUT believes that telco entry into broader information service markets is slowly subsiding, in part due to the rapid involvement of the BOCs and the need for an evaluation period. However, fewer "independent" firms will maintain a presence into the 1990s. Those that will remain will often do so because they have found profitable and highly specific market niches and have entered into successful marketing and distribution agreements with telco subsidiaries.

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- Technological change is creating new opportunities in the telecommunications segment. Many of the BOCs are installing local packet switching networks and are positioning themselves to offer protocol conversion services when the regulatory climate permits. These new networks will require tracking and bill accounting systems.

- Software and systems supporting security functions within data and voice services are needed. Software is being developed to spot "hackers" attempting to test access codes against long-distance exchanges. Once detected, the next attempt is permitted, the line trapped, and the call traced to the violator.

- The Integrated Services Digital Network (ISDN) is currently being tested. When implemented, ISDN-related applications will be needed. Examples include messaging, teleconferencing, data base information services, transactions and telemetry applications for alarms, equipment monitoring, and utility management. ISDN thus represents opportunities for software development, professional services, information providers, and third-party services. Exhibit V-1 presents the range of ISDN distribution services.

- Opportunistic enterprises in information services (such as 976-exchange audiotex services), cellular telephone, long-distance, reselling, shared tenant services, and satellite services have arisen.

  - These newer participants often approach business with financial and marketing concerns overriding information service concerns and creating opportunities as well as risks.

  - Unproven new enterprises may fail, and vendors may be left without an opportunity to benefit from an ongoing relationship after an expensive sales and development process.

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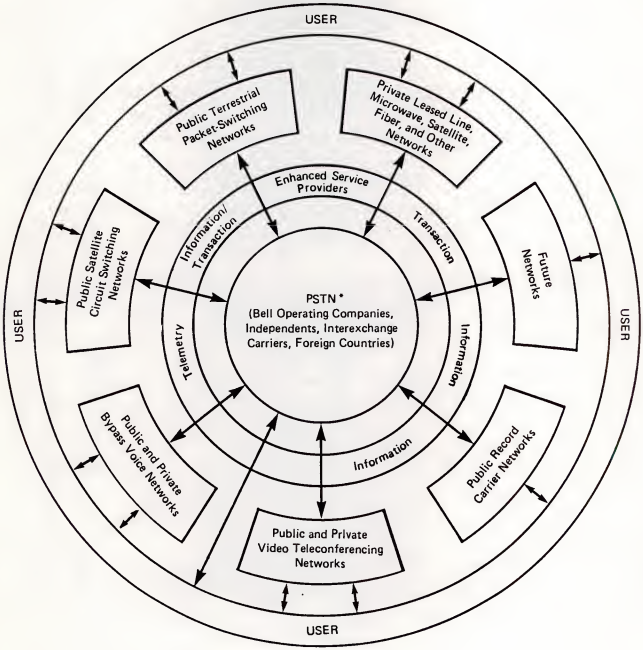
EXHIBIT V-1

ISDN DISTRIBUTION SERVICES



* PSTN = Public Switched Telephone Network

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- Cautious approaches are particularly recommended for shared tenant services which have thus far failed to generate significant interest from tenants.

- Pay phone services are changing, with new credit card billing systems requiring software and processing services.

  - The sale of Western Union's airliner-based Airfone to GTE should lead to reduced charges and more volume; however, the processing components of this business and its Railphone equivalent are expected to be captive, with GTE Data Services as the provider.

  - Other opportunities for pay phone services may be found related to other forms of transportation--commuter buses, ferries, urban transit, ocean liners.

- Cellular systems are operated by either independent firms or subsidiaries of the LECs. Due to regulatory and business requirements, these subsidiaries will often use RCS firms or internal systems to handle their billing.

  - The cellular industry is characterized by volatile pricing driven by competitive influences, requiring the ability to change price schedules rapidly.

  - There are billing format inconsistencies between the regular telephone system, cellular billing, and "roamer" billing which need to be addressed.

  - In addition to billing services, cellular operators require value-added services such as traffic pattern analysis, channel use statistics, and equipment efficiency reports.

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- Professional service opportunities are significant. Several have been reported above in the vendor profiles; professional services are addressed elsewhere in this volume.

- Fiber optic networks, for the most part, are being designed as bulk service providers to other carriers. As end-to-end, switched services (including the local loop) via fiber cables are introduced, information systems to implement and then manage them will be needed.

- Other emerging areas in telecommunications are mobile data applications (using cellular, paging, or other radio common carrier frequencies) for field personnel and other requirements, digital radio-based rural telephone systems, proposed mobile satellite communications services, and radio positioning/messaging systems.

- Proposed rural telephone systems may offer niche opportunities. An estimated one million homes are currently beyond telephone network services. Cellular-like systems are being proposed for new installations and as replacement systems.

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VI RECOMMENDATIONS AND CONCLUSIONS

- For vendors considering product or service development in this market, INPUT recommends:

  - Recognition be made of the long lead times and planning cycles characteristic of many telephone operations, leading to long sales cycles, particularly in regulated segments. This sluggishness, a holdover from the regulated environment, also means prospective competition from BOC subsidiaries may be developmentally slowed.

  - Vendors be aware of the fact that needed systems are often massively complex and interrelated, a fact that can heavily influence service or software design.

  - Vendors recognize that the levels of automation can be significantly different among entities, related to specific segment, prospect size, location, culture, and requirements.

  - Vendors examine ways of adapting software, systems, and services to large telecommunications users who are operating and managing their own facilities and to international (particularly developing) markets where telecommunications infrastructures are being developed.

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VII FORECAST RECONCILIATION

- Exhibit VII-1 shows the variances in both the long- and short-term projections for user expenditures for information services in the telecommunications market when comparing INPUT's 1985 and 1986 report findings.

A. PROCESSING SERVICES

- INPUT's 1985 market sizing for remote/batch services remains constant; however, the 1990 market size is estimated at $766 million (compared to $745 million) for a 3% increase over that projected in the 1985 report. The AAGR forecast through 1991 is 18%, one point higher than the 1985-1990 AAGR forecast of 17%.

- The 1985 market size for facilities management processing services varies from INPUT's 1985 estimate by a negative 6%, but this turns out to be a minor change. Instead of $18 million, the 1985 market is sized at $17 million due to a shift in classifying some revenues from FM to processing services, a result of a refined definition. Instead of a 17% AAGR as reported for 1985-1990 in our 1985 report, the AAGR from 1986 through 1991 is now forecast at 20% for facilities management.

- The result is a minor decrease of the estimated 1985 market for all processing services and an increase in the size of the 1990 market, with a total proces-

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EXHIBIT VII-1

TELECOMMUNICATIONS SECTOR - DATA BASE RECONCILIATION OF MARKET FORECAST BY DELIVERY MODE

DELIVERY MODE	1985 MARKET			1990 MARKET			1985-1990 AAGR Forecast in 1985 Report (Percent)	1986-1991 AAGR Forecast in 1986 Report (Percent)
	1985 Forecast ($ Millions)	1985 Report ($ Millions)	Variance as Percent of 1986 Report	1985 Forecast ($ Millions)	1986 Forecast ($ Millions)	Variance as Percent of 1986 Forecast		
Processing Services								
Remote Computing/ Batch Services	$340	$340	0%	$745	$766	-3%	17%	18%
Facility Management	18	17	6%	40	43	-7%	17%	20%
Total Processing Services	$358	$357	0%	$785	$809	-3%	17%	18%
Application Software	$ 47	$ 49	-4%	$260	$264	-2%	41%	40%
Turnkey Systems	$199	$199	0%	$500	$497	1%	20%	21%

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sing services AAGR of 18% through 1991, compared to a 17% AAGR (through 1990) in the 1985 report.

B. APPLICATIONS SOFTWARE

- Instead of a $47 million 1985 market, INPUT now sizes this market at $49 million for a 4% increase. The 1990 market grows by $4 million, but the comparable AAGR (for 1985-1990 versus 1986-1991) declines from 41% to 40%.

C. TURNKEY SYSTEMS

- The forecasts and projections for turnkey systems remain relatively constant, with only minor variances between the reports.

- As can be seen, the changes reported between the 1985 and current report are marginal.

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U.S. INFORMATION SERVICES
VERTICAL MARKETS, 1986-1991
TRANSPORTATION SECTOR

DECEMBER 1986

U.S. INFORMATION SERVICES
VERTICAL MARKETS, 1986-1991
TRANSPORTATION SECTOR

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U.S. INFORMATION SERVICES
VERTICAL MARKETS, 1986-1991
TRANSPORTATION SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- The transportation industry sector, comprised of the airline, railroad, trucking, and other transportation segments, has experienced moderate growth during the past few years, which is expected to continue for at least the next few years.

- Deregulation and economic conditions have contributed to increased competition and consolidation within each of the segments as well as competition between the modes of transportation and the development of intermodal transportation offerings.

- Cost containment, increased productivity/efficiency, and improved services provided to customers are all factors in achieving profitability and competing effectively in the deregulated environment.

B. AIRLINES

- The U.S. airline industry segment is highly skewed with respect to airline size. Twelve major airlines, such as Eastern, Pan American, United, and Trans World, dominate the industry, capturing approximately 80% of the

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segment's revenues in 1985. National carriers held approximately 14% of the segment's market share in 1985, while large and medium regional airlines took 3%, and smaller regional and commuter airlines held little more than a 1% market share in the segment.

- Operating revenues for the airlines rose approximately 8% in 1986, continuing the growth of the past three years. Factors contributing to the overall growth of the industry segment include the 3-4% inflation rate averaged over the last few years, decreased fuel prices and labor costs, and increased use of discount fares. Some carriers, however, have experienced severe financial problems because of the intense competition within the segment.

- Moderate growth is expected to continue for the segment over the next few years; however, stronger labor demands and fare wars will serve to increase competition among carriers.

C. RAILROADS

- The freight railroad industry segment continues to move toward fewer and larger railroads as well as intermodal companies. In 1985, the seven largest railroads--Burlington Northern, CSX, Norfolk Southern, Pacific Rail, Conrail, Southern Pacific, and the Atchison, Topeka and Santa Fe--accounted for more than 80% of total rail revenues and ton-miles.

- Rail traffic volumes for 1986 are expected to be approximately 3% above 1985 levels. Railroad traffic growth is dependent on strength in the economy, coal production, grain exports, and several key rail-served industries such as steel, chemicals, automobiles, paper products, and agriculture.

  - Railroads are also affected by other modes of competition, particularly trucking.

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- Technical innovations, increased quality of service, improvements in railroad fuel consumption, and an increase in overall railroad efficiency resulting from mergers should permit the segment to maintain current traffic and attract new business.

- Rail passenger service includes long-distance intercity services, provided by Amtrak, and commuter services, provided by Amtrak, Class I railroads, and local commuter lines.

- Amtrak experienced a 14% increase in passenger revenues in 1985. Ridership increased 6% during the year and is expected to increase approximately 5% in 1986. In addition, Amtrak covered 50% of its operating costs in 1982--three years before it was required to do so--and is now operating well above that level.

  - These results are due to Amtrak's marketing efforts and the growing popularity of its autotrain services carrying passengers and their cars between Washington, D.C., and Florida.

D. TRUCKING

- During 1985, industry tonnage, revenue, and profit levels for the trucking segment fell below expectations as growth in other industries, such as manufacturing and agriculture, slowed.

- Many carriers, unable to withstand the price-cost squeeze in a highly competitive environment, failed during 1985. Dun & Bradstreet reported that the number of failed trucking companies has increased each year since 1980. As a result, insurance costs have soared.

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- Other trucking companies have successfully engaged in new opportunities. Changes in marketing and operating practices continue due to less economic regulation and the development of technology for costing and pricing, productivity, logistics planning, management information systems, and communications.

- Growth in less-than-truckload (LTL) business has come from the extension of established LTL carrier systems. These companies have improved market share by going outside current markets and increasing the number of terminals and the locations served.

- Trucking companies that can meet the precise performance requirements for just-in-time (JiT) distribution systems and at acceptable prices also have significant opportunities in trucking.

- Acquisitions, mergers, and franchises have provided the means for trucking operations to expand services and geographic areas covered while combining the benefits of centralized and regional management systems.

- Moderate growth for the trucking segment is expected to continue, although improved efficiencies in planning and operations may be offset by the effects of price competition and by cost increases for labor and insurance.

- Failures, reorganizations, mergers, and acquisitions will continue for marginal carriers while the more profitable carriers will continue to improve their position in the industry.

  - Earnings of five major players in the trucking segment--Consolidated Freightways, Yellow Freight System, Roadway Services, Carolina Freight, and Overnight Transportation--are expected to grow 10% to 14% per year for the next five years.

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E. OTHER TRANSPORTATION

- Other transportation industry segments include air cargo, water transportation, mass transit, postal service, pipelines, and transportation services.

- The air cargo industry segment is showing signs of a shakeout similar to that experienced by the passenger airlines since deregulation. Of the seven largest U.S. air freight carriers, only three or four are expected to survive over the next five years.

  - Flying Tigers' future is uncertain due to losses sustained by the company, Puralator Courier put itself up for sale in 1986, and Airborne Freight has recently become the target of a hostile offer from an Australian carrier, TNT Ltd.

- Future growth in the domestic water transportation industry segment is favorable since the segment is tied closely to domestic economic conditions. U.S. flag foreign trade lines, however, are dependent on domestic and international economic conditions and foreign trade. Debt problems in developing countries and oil export levels are two major factors influencing the success of these companies.

  - Several U.S. oceanliner companies are developing intermodal capabilities to move freight directly between origin and destination points via ship, train, and truck using containers that do not need to be repacked enroute.

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II MARKET FORECASTS

A. INTRODUCTION

- Demand for transportation industry-specific information services will grow 18% annually through 1991, increasing from $544 million in 1986 to $1.3 billion in 1991. For details, see Exhibits II-1 through II-3 and Appendix Exhibit TR-A-1.

- Transportation user expenditures for information services will increase at an average annual growth rate higher than revenue growth rates expected during the next five years for the following reasons:

  - Information services make a significant contribution toward improving efficiency, allowing companies to offer additional services to their customers, and containing costs and increasing profitability, which are essential to remaining competitive in the deregulated environment.

  - Transportation companies recognize the importance of information systems and new technology and are increasing their investments in these areas.

- Appendix TR contains the forecast data base for each year from 1985 to 1991 for the transportation sector as well as for the airline, railroad, trucking, and other transportation segments.

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EXHIBIT II-1

TRANSPORTATION SECTOR
INDUSTRY-SPECIFIC USER EXPENDITURES
1986-1991

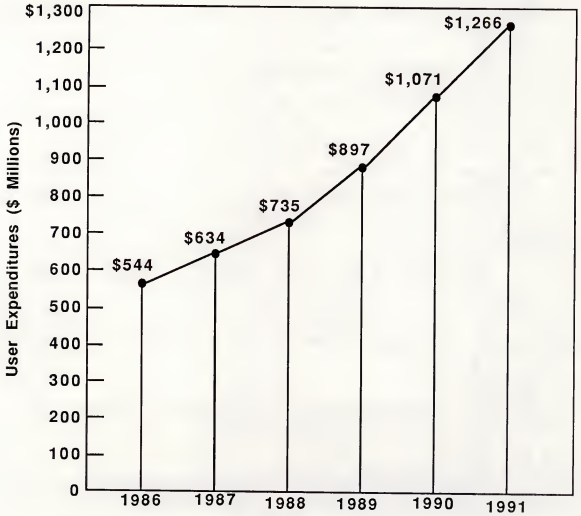

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EXHIBIT II-2

TRANSPORTATION SECTOR MARKET FORECAST COMPARISON
INDUSTRY-SPECIFIC INFORMATION SERVICES
1986-1991

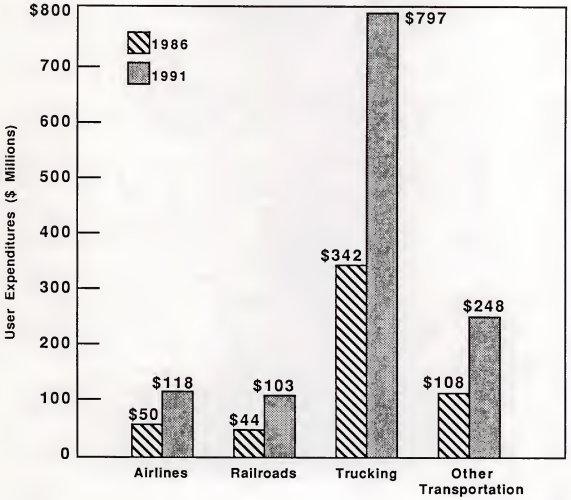

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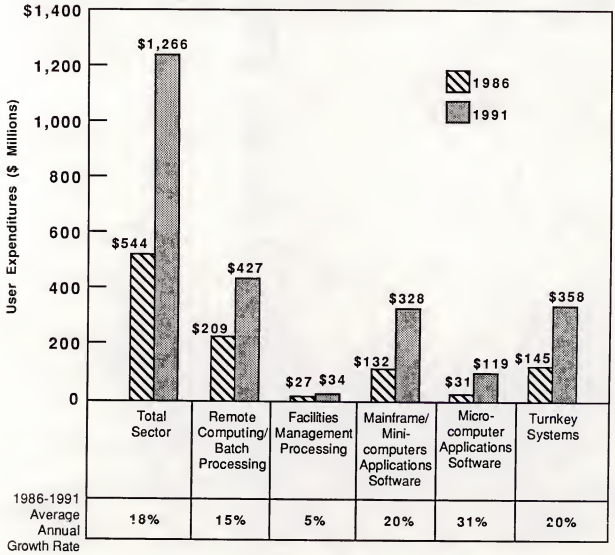
EXHIBIT II-3

TRANSPORTATION SECTOR INDUSTRY-SPECIFIC USER EXPENDITURE FORECAST BY DELIVERY MODE 1986-1991



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B. AIRLINES

- User expenditures for information services in the airlines will grow 19% annually through 1991, with 1991 expenditures totaling $118 million (see Exhibits II-4 and Appendix Exhibit TR-A-2).

  - Expenditures for applications software by the airline segment will grow at an average annual growth rate of 22% over the next five years, reaching $44 million in 1991.

  - Turnkey systems expenditures will grow to $33 million in 1991, at an average annual growth rate of 20%.

  - Processing services are forecast to reach $41 million in 1991, growing at an average rate of 14% annually.

- The level of spending by the airline segment will increase over the next five years for the following reasons:

  - Airlines will purchase software and other computer services in order to improve profitability by increasing productivity and decreasing labor and other costs.

  - Competition will force cost containment as well as increase the level of services expected by customers.

  - Airlines are operating in a technology-oriented environment. When they choose to ignore this environment, they fail. For example, People Express opted not to be listed on United Airlines' Apollo reservation system with other airlines and performed poorly for the two quarters that followed.

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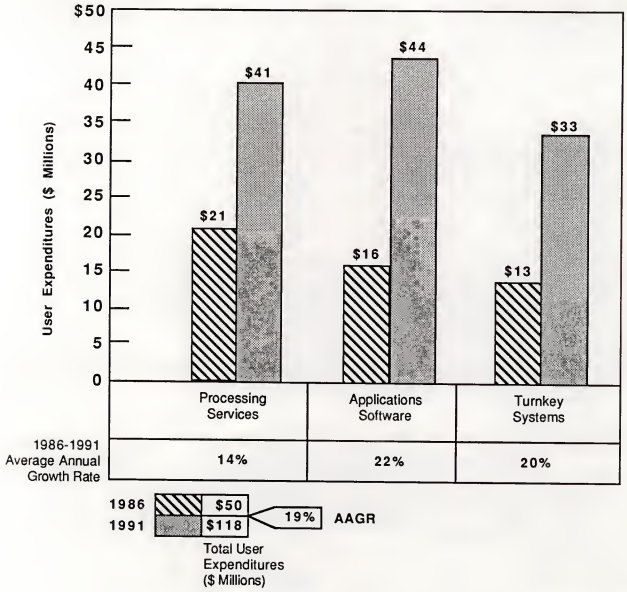
EXHIBIT II-4

AIRLINE SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES
1986-1991



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- Information services permit communication of information between various points of transaction. Management needs this information to make well-informed decisions quickly.

- User expenditures for information services are less for the airline segment than for the trucking and other transportation segments due to the following:

  - There are fewer airlines than trucking and other transportation companies.

  - Computer services developed by airlines for their own internal use are not part of INPUT's industry market forecasts.

  - Acquired companies whose parent organizations use internally-developed applications also have access to these applications.

- Airline information systems comprise the following types of applications:

  - Aircraft and rotable parts maintenance management.

  - Airline crew scheduling.

  - Airline reservation.

  - Airline statistics and revenue reports.

  - Aircraft and crew mission reporting and projections.

  - Ticket auditing.

- Reservation systems are the primary information systems currently used by the airline segment. Financial reporting systems developed specifically for airlines are also ranked high in importance by the segment because of the need for cost measurement and control to remain profitable.

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C. RAILROADS

- Users expenditures for information services in the railroads will grow 19% annually through 1991, with 1991 expenditures totaling $103 million (see Exhibits II-5 and Appendix Exhibit TR-A-3).

  - Expenditures for applications software by the railroad segment will grow at an average annual growth rate of 24% over the next five years, reaching $41 million in 1991.

  - Turnkey systems expenditures will grow to $29 million in 1991, at an average annual growth rate of 19%.

  - Processing services are forecasted to reach $33 million in 1991, growing at an average rate of 13% annually.

- Railroad segment spending for information services will increase over the next five years due to the following:

  - New opportunities, such as intermodal transportation, are opening up to the railroads that will allow them to provide additional services to their customers and require increased use of information services.

  - Cost containment, efficiency, and profitability are just as important to the railroad segment's survival as any of the other transportation segments. Even Amtrak, a passenger railroad subsidized by the government, is expected to meet certain performance criteria while competing in a deregulated environment against other modes of transportation.

- User expenditures for information services are less for the railroad segment than for any of the other transportation segments.

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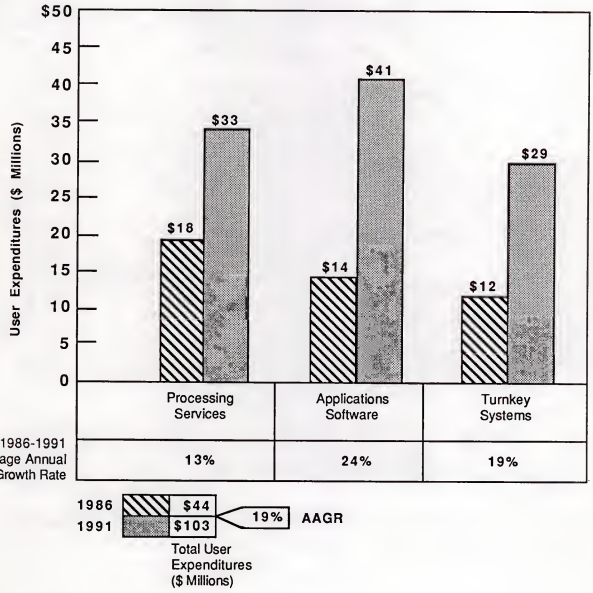
EXHIBIT II-5

RAILROAD SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES
1986-1991



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- There are fewer railroads than companies in other segments.

- Projected revenue growth rates for the railroads over the next five years are lower than for other segments.

- Like the airline, trucking, and other transportation segments, railroads have developed computer services for their own internal use, which are not included in user expenditure forecasts.

- In addition, substantial consolidation within the segment has involved a sharing of internally developed resources.

- Railroad information systems comprise the following types of applications:

  - Automated reservation.

  - Railcar management.

  - Mileage credit audit.

  - Railcar tracking.

D. TRUCKING

- User expenditures for information services in the trucking industry segment are expected to grow at an average annual rate of 18% for the next five years, reaching $797 million by 1991 (see Exhibits II-6 and Appendix Exhibit TR-A-4).

  - Applications software expenditures will grow 22% and reach $277 million in 1991.

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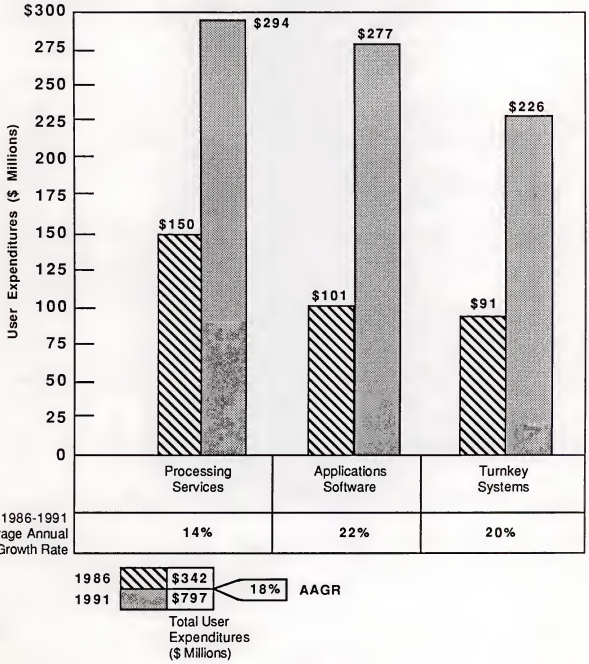
TRUCKING SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES
1986-1991



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- Turnkey systems, growing at an average rate of 20% per year, will grow from $91 million in 1986 to $226 million in 1991.

- User expenditures for processing services in this segment will grow at an average annual rate of 14%; trucking companies are expected to spend $294 million for processing services in 1991.

- Expenditures for information services by the trucking industry segment represent the largest portion of information services expenditures for the transportation industry for the following reasons:

  - Due to easy entrance into trucking and the diverse nature of the business, there are more firms in the trucking segment than in any of the other transportation segments, even though some consolidation is occurring in the trucking segment. In fact, there are thousands of trucking companies all competing in the deregulated environment.

  - Success in trucking lies in developing market niches, which require specialized computer services. In general, these companies are smaller than those in other segments, and it makes sense for these firms to buy applications rather than developing them internally.

  - In the trucking industry segment, there are multiple points of transaction, creating a need to collect and disburse an enormous amount of data and channel it through communication lines.

- Trucking applications include the following:

  - Freight rate data base maintenance and automatic rating system.

  - On-line system which audits and analyzes freight bills and prevents duplicate payments.

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- Truck routing and mileage system.

- Fuel and mileage reporting system.

- Fuel tax and mileage system.

- Integrated system for vehicle maintenance, parts inventory, preventive maintenance, scheduling, mechanic statistics, repair orders, and fuel and mileage reporting.

- Vehicle routing system that reduces fuel cost by determining the optimum route for the movement of products from shipping points to customer locations.

- Integrated system for rating, payroll, freight billing, accounts payable, accounts receivable, shipper and sales analysis reporting, financial statements, trip and mileage reporting, vehicle maintenance, driver settlements, dispatching, and inventory control.

- Haulage booking, accounting, and profitability.

- Union contract payroll system.

- Driver log system that checks driver violations and missing logs.

- On-line system designed for LTL freight companies.

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E. OTHER TRANSPORTATION

- User expenditures for the other transportation segments are expected to grow from $108 million to $248 million during 1986-1991, at an average annual rate of 18% (see Exhibit II-7 and Appendix Exhibit TR-A-5).
  - Expenditures for applications will total $85 million in 1991, growing at an average annual rate of 22% per year.
  - Turnkey systems expenditures will reach $70 million, growing at an average of 19% per year.
  - Processing services expenditures by the other transportation segments are expected to grow at an average of 15% per year to reach $93 million in 1991.
- Some applications for the other transportation segments are listed below:
  - Air cargo reservation and invoicing system.
  - Water transportation cargo booking system.
  - Container survey reporting system.
  - Water transport fleet management information system.
  - Water transport fleet scheduling system.
  - Marine personnel, payroll, and planning system.
  - Ocean freight cost system.

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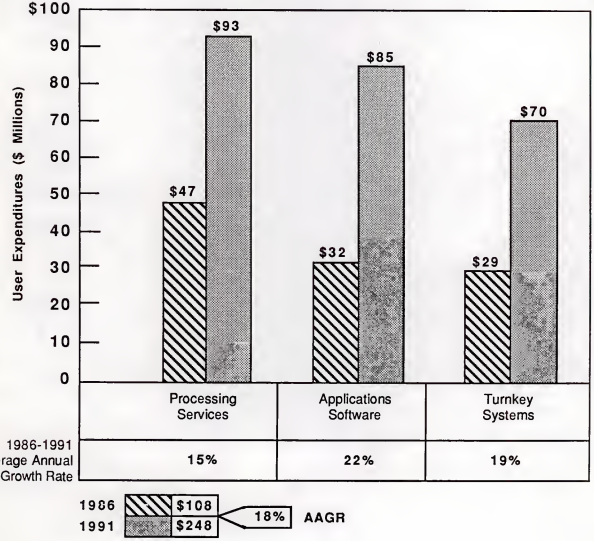
EXHIBIT II-7

OTHER TRANSPORTATION SEGMENT FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES
1986-1991



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- Terminal control system for operation and control of ocean shipping terminals.

- Vessel performance reporting system.

- Ferry/cruise reservation and passenger documentation system.

- Graphic design program for public transit systems.

- Automated transit data retrieval and route selection system.

- Transit management system for scheduling vehicle maintenance and providing revenue, ridership, and safety analysis for public and private bus lines or for fleet operations.

- Computer-assisted packaging evaluation system.

- Common carrier service dependability index.

- Real-time freight forwarding system incorporating full export/import procedures, unit load, air freight, and customs procedures.

- Management control of large or small vehicle fleets.

- Tariff management and freight bill processing.

- Traffic rate and routing system for all modes of transportation.

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F. PROCESSING SERVICES

- User expenditures for remote computing and batch processing services will grow at an average annual growth rate of 15% over the next five years for the transportation industry sector, reaching $427 million in 1991 (see Exhibit II-8 and Appendix Exhibit TR-A-1).

- In terms of revenues generated from processing services for the transportation sector, the leader is funds transfer services provided to in-transit truckers.

- Airline reservation systems, typically provided by the airlines, are also widely used processing services in the transportation industry sector.

- User expenditures for facilities management processing services will grow at only 5% annually over the next five years for the sector.

- As transportation companies become more sophisticated computer users, processing will increasingly be handled in-house. Facilities management services provided by outside vendors will be required only to a limited extent.

G. TURNKEY SYSTEMS

- As the growth in user expenditures for processing services decelerates over the next five years, the turnkey systems market will open up for vendors providing services to the transportation sector.

- User expenditures from the transportation sector for turnkey systems will grow at an average annual growth rate of 20% from 1986 to 1991 (see Appendix Exhibit TR-A-1).

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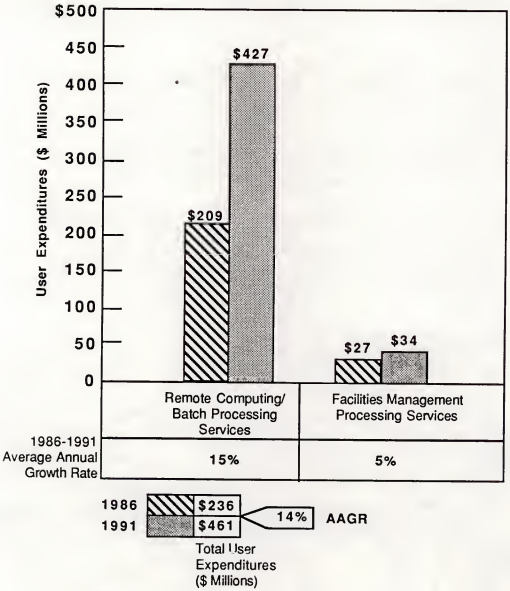
EXHIBIT II-8

TRANSPORTATION SEGMENT FORECAST
INDUSTRY-SPECIFIC PROCESSING SERVICES
1986-1991



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- The following applications are available as turnkey systems for transportation companies:

  - Aircraft maintenance and rotables system.
  - Airline reservation system.
  - Fleet management system.
  - Driver data system.
  - Liquid inventory system.
  - LTL transportation system.
  - Vehicle maintenance and efficiency system.

H. APPLICATIONS SOFTWARE

- The applications software market for the transportation sector will grow from $163 million in 1986 to $447 million in 1991, at an average annual growth rate of 22% (see Exhibit II-9 and Appendix Exhibit TR-A-1).

- User expenditures by the sector for microcomputer applications will increase at an average rate of 31% over the next five years from the relatively small base of $31 million 1986 to $119 million by 1991.

- Expenditures by transportation companies for mainframe and minicomputer applications software will increase from $132 million in 1986 to $328 million in 1991, growing an average of 20% annually.

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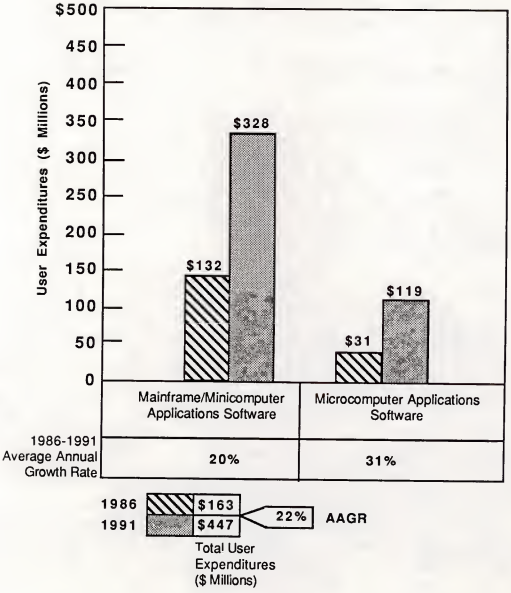
EXHIBIT II-9

TRANSPORTATION SEGMENT FORECAST
INDUSTRY-SPECIFIC APPLICATIONS SOFTWARE
1986-1991



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III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The transportation information systems market is characterized by relatively few large processing services vendors and a widely diversified group of applications software and turnkey systems vendors. This diverse group includes literally hundreds of small firms providing computer services to transportation and other industries and larger firms with only a very small portion of their revenues generated from industry-specific products sold to the transportation industry.

  - In researching the industry, INPUT found that companies are not generating more than $2-3 million each from industry-specific applications and turnkey systems sold to the transportation industry.

- Market share information for some of the vendors providing transportation systems is provided in Exhibit III-1.

- Overlap exists between the industry-specific applications used by transportation companies and companies in other industries involving distribution, such as manufacturing, wholesale, and retail distribution. Fleet management systems and vehicle maintenance systems are used by many companies in a variety of industries.

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EXHIBIT III-1

VENDOR SHARES OF TRANSPORTATION SECTOR INDUSTRY-SPECIFIC INFORMATION SERVICES IN 1985* ($ MILLIONS)

Vendor Name	Processing Services	Applications Software	Turnkey Systems	Total	Percent Share of Transportation Information Services
Comdata Network	$51.0			$ 51.0	11.0%
Cass Information Systems	12.0			12.0	2.5%
American Airlines**	7.0			7.0	1.5%
FundsNet	7.0			7.0	1.5%
Cogito Data Systems	5.0			5.0	1.0%
United Airlines**	4.0			4.0	1.0%
Distribution Sciences	2.5	$ 0.5		3.0	1.0%
Trans Tech Services		0.5	$ 2.5	3.0	1.0%
McDonnell-Douglas Information Services Group Transportation Systems		2.0		2.0	0.5%
National Data Corporation	2.0			2.0	0.5%
Display Data Corporation		1.0		1.0	0.2%
Distribution Management Systems		1.0		1.0	0.2%
ATA Services	0.5	0.5		1.0	0.2%
ASCO Flight Watch		0.5		0.5	0.1%
Total	$ 91.0	$ 6.0	$2.5	$ 99.5	22.2%

* Vendor shares based on INPUT estimates of calendar year 1985 revenue generated from transportation industry-specific information services

**Represents fees from airlines and travel agencies versus additional revenue generated from the system being in place.

MSPA-TR S

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- In addition, overlap exists between the systems used by the various transportation segments, especially the railroad and trucking segments.

- Many airlines, railroads, trucking firms, and other transportation companies have developed applications for internal use and are now marketing these products externally.

  - American Airlines, Eastern, TWA, and Delta provide reservation systems to transportation services organizations (e.g., travel agencies) generating revenue from these organizations and other airlines. Controversy has arisen regarding the built-in biases of these systems.

  - Railroads, such as Southern Pacific, provide computer services to short-line railroads and other companies. Southern Pacific provides a software package that links PCs to Southern Pacific's mainframe for rail and intermodal shipping applications. The system, SP Liberator, is used to locate shipments, determine intermodal shipment rates, and handle shipment-related paperwork.

  - A major trucking firm that has expanded its service offerings to include computer services for the transportation sector is Leaseway Transportation, headquartered in Cleveland (OH), which provides distribution systems and consulting services to outside customers.

B. VENDOR PROFILES

- The following are profiles of the leading vendors in the industry.

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1. COMDATA NETWORK, INC. (2209 Crestmoor Road, Nashville, TN 37215)
Revenue (FYE 12/31/85): $91.7 million

a. Products/Services

- Comdata Network, Inc. provides funds transfer services to the trucking industry and offers check verification processing services for retail establishments.

- Comdata's processing services for the transportation industry include Comchek and Express Comchek Funds Transfer Services, Fuel Purchase Program, Permit Transfer Program, and COMVOY Shipment Interchange Program.

  - With Comchek, a request for transfer of funds is made through a Comchek Service Center to Comdata. Comdata verifies the truck company's credit and notifies the Service Center as to the amount and recipient of the requested draft. The driver provides identification, Comdata issues an authorization number, and the driver endorses the draft in exchange for cash.

  - Express Comchek increases the speed and reduces the communication expense of money transfers. The driver is furnished with a supply of blank Comchek drafts. Upon request, an express code is given by his dispatcher. A completed draft is presented to the Service Center, an authorization is obtained, and the driver receives cash in exchange for the draft.

  - The Fuel Purchase Program permits trucking companies and other transportation customers to obtain cash discounts on fuel purchases through an identification card system.

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- Comdata also offers its Permit Transfer System to clients requiring special regulatory permits to transport shipments within certain states.

- The COMVOY Shipment Interchange Program allows shippers and carriers to electronically match shipments with available truck cargo space.

- Funds transfer services are provided to individual credit card holders through Comdata Service Centers located at truckstops, gambling casinos, motels, hotels, and college campuses.

b. Markets Served

- Comdata markets its services to the trucking industry, credit card holders, and retail establishments.

c. Company Strategy

- Comdata's acquisition of Cashex in 1983 provided a growth opportunity for the company in the check authorization and guaranty service business.

- Comdata has increased the credit requirements of its trucking customers who were feeling the effects of price competition resulting from deregulation.

- The company attributes its success to the unique systems design of its electronic funds transfer system.

d. Recent Activities

- The company has developed a new marketing team which has been assigned the responsibility of increasing Comdata's presence in the business of public money transfer.

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e. Future Directions

- Deregulation produced the need for increased vehicle utilization to effectively compete. Comdata's COMVOY system is used to schedule fleets and electronically transfer information on shipments that must be rescheduled to Comdata's main data base, where the information is immediately available to all participating trucking customers. Comdata will continue to develop new services like these for the trucking industry.

2. CASS INFORMATION SYSTEMS (1015 Locust Street, St. Louis, MO 63101)
Revenue (FYE 12/31/86): $131 million (INPUT estimate)

a. Products/Services

- Cass Information Systems provides processing services to the transportation industry utilizing a Tandem NONSTOP TXP computer. Customers access the following applications via phone lines:

  - Transdata, a transportation reporting system designed to monitor and reduce the cost of inbound and outbound freight.

  - Transaction, a data base information system used to manage and update historical transportation information.

  - Freightpay, an accounts payable system that can handle freight payments and maximize cash flow.

  - Rate-Chek, a flexible freight bill auditing system that can be used in pre-audit, immediate audit, and post-audit environments.

  - Translink, a financial control system that matches preauthorized order records of transportation activities with related freight expenditures.

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- Compu-Rate, a client-based rating system including computer rating, computer auditing, tariff maintenance, rate quotation, prepay and add invoicing, and shipment planning.

b. Markets Served

- Cass Information Systems primarily targets the transportation industry for its products. However, developing information management systems for the transportation industry also equipped the company to expand its services to meet the distribution, accounting, and information and transportation management needs of Fortune 500 companies in diverse industries.

c. Company Strategy

- Cass Information Systems views itself as a customer's partner in providing integrated transportation management information systems.

d. Recent Activities

- Rate-Chek, the freight bill auditing system, was recently added to the list of applications offered to processing customers.

e. Future Directions

- Cass Information Systems will offer new applications to assist major corporate shippers in distributing products.

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3. FUNDSNET, INC. (385 Nordhoff Place, Englewood, NJ 07631)
Revenue (FYE 12/31/85): $15 million

a. Products/Services

- FundsNet, Inc. provides electronic funds processing and transfer services to the transportation industry and the consumer public and provides credit card processing services to retail establishments and the travel and entertainment industry.

  - Dial-a-Check offers trucking companies a method of transferring funds to their drivers while enroute.

  - Action Check, an enhancement to the Dial-a-Check service. With this service, the trucking company provides its drivers with preauthorized coded vouchers for presentation at service centers.

  - National Purchasing System makes use of Dial-a-Check via FundsNet plastic identification cards that are issued by transportation companies to their drivers.

  - Cashcall services is offered at over 125 resort hotels, race tracks, casinos, and campgrounds across the U.S., as well as Puerto Rico and the Bahamas. Consumers can obtain a cash transfer by utilizing their VISA or MasterCard on FundsNet or other terminals located at the establishment's service center.

b. Markets Served

- FundsNet's revenue is derived from the transportation industry, credit card holders, and retail distributors.

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c. Company Strategy

- FundsNet considers itself to be an innovator in the funds transfer service business.

- In 1984, the company invested substantially in a new and upgraded technology used in the services provided to the transportation industry. The decline in operating costs of 5.5% as a percentage of revenue in 1985 demonstrates the success of the investment.

d. Recent Activities

- Transportation services grew 7% in transaction volume in 1985; however, revenue increases were small due to price competition.

e. Future Directions

- Management plans to take advantage of new expansion opportunities in the financial services industry.

4. COGITO DATA SYSTEMS (1101 State Road, Princeton, NJ 08540)
Revenue (FYE 10/31/86): $12 million (INPUT estimate)

a. Products/Services

- Cogito Data Systems provides processing and professional services for large vehicle fleet maintenance and management and processing and turnkey systems for educational institutions.

- Processing and professional services for fleet maintenance and management is provided by two of the company's operating subsidiaries, Mainstem Corporation and Mainstem Canada Ltd.

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b. Markets Served

- Cogito's markets include transportation companies and educational institutions throughout the U.S. and in Canada.

c. Company Strategy

- Originally founded as Petroleum Data Corporation (Petrodata) to provide processing and consulting services to retail fuel dealers, Cogito Data Systems' strategy has been to expand into multiple vertical marketplaces. For example, in 1983 the company acquired Automated Fleet Services (AFS). AFS provided batch processing and professional services for large vehicle fleet maintenance and management, concentrating on private companies and private carriers.

d. Recent Activities

- Cogito sold its Petrodata division in 1985 to ICC, Inc. of Cedar Hills (NJ).

e. Future Directions

- Through value-added dealer agreements, joint marketing agreements, and new product development, Cogito will expand its product/service offerings for fleet management, as well as educational administration, including a turnkey system for fleet management sold on Burroughs equipment.

5. UNITED AIRLINES APOLLO SERVICES (P.O. Box 66100, Chicago, IL 60666)
Revenue (FYE 12/31/86): $4 million (INPUT estimate)

a. Products/Services

- United Airlines' computerized reservation system, Apollo, introduced in 1976, is based on a reservation system developed for internal use in 1970. Apollo

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provides travel agents access to listings for all major airlines as well as for hotels, car rentals, and other travel-related services. In addition to reservation processing, the system provides additional services such as the Apollo Business System, an office automation application for travel agents that has facilities for accounting, reporting, and other office automation functions. The company utilizes seven IBM mainframes customized for airline transaction processing (model 9090) at its applications center in Denver (CO).

b. Markets Served

- Apollo Services targets travel agencies, charging fees for the services to the agencies and other airlines.

c. Company Strategy

- Automating travel agencies with the Apollo system has proven successful as a way to increase bookings of United flights from 10% to 35% per agency. Apollo Services' current business objective is to add new, salable features to the reservation system.

d. Recent Activities

- During 1986, United Airlines acquired accounting and management software for travel agencies from McDonnell Douglas. McDonnell Douglas' TS2000 Travel System Unit was merged into United's Apollo Services computerized reservation unit.

e. Future Directions

- Over the next five years, the company plans to spend $1 billion to replace the Business System, which grew from one accounting program developed in the late 1970s. The new system will be the modular Enterprise Agency Management System, now being written by IBM.

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6. DISTRIBUTION SCIENCES, INC. (1350 E. Touhy Avenue, Des Plains, IL 60018)
Revenue (FYE 6/30/86): $3 million

a. Products/Services

- Distribution Sciences provides the following applications software products to the transportation industry. With the exception of ZIP Rate PC, these products run on IBM 370, 43XX, and 30XX systems.

  - MATCHPAY, a freight rate auditing and freight bill payment system.

  - PreShipment Planning, an order consolidation carrier selection system.

  - Base Rate, a freight rating carrier selection system.

  - ZIP Rate PC, a freight rating and carrier selection system for IBM PCs and compatibles.

- Distribution Sciences provides the following batch and on-line processing services to its customers utilizing IBM 30XX computers.

  - Auto Rate, a freight rating service delivered via batch processing.

  - Frate Bank, an on-line service offering access to various transportation data bases and software, such as freight rating, carrier selection, distribution analysis, and analysis of carrier tariffs. Frate Bank is accessed through Tymnet or directly via phone lines.

- In addition, Distribution Sciences provides consulting services to the transportation industry. Projects vary and range in length from two weeks to one year.

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b. Markets Served

- Distribution Sciences provides its applications software, processing services, and professional services to transportation and other companies providing freight distribution.

c. Company Strategy

- Distribution Sciences provides consulting services that help solve common transportation/distribution problems when there is a potential for large cost savings. Distribution Sciences offers a way for transportation companies to start using its applications through processiong services. When it is understood what more is needed, Distribution Sciences sells its applications or develops new systems for the customer.

d. Recent Activities

- Distribution Sciences recently introduced an electronic data interchange capability (EDI) for its products. In addition, the company has introduced an enhancement to its PreShipment Plannning system which allows zone skipping--essentially, group shipments--to effect cost savings in the distribution of large volumes of small packages.

e. Future Directions

- Distribution Sciences is not yet ready to make any announcements regarding its future products and services. The company does, however, plan to leverage existing technologies to venture into new business areas.

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7. TRANS TECH SERVICES, INC. (4309 Hacienda Drive, Pleasanton, CA 94566)
Revenue (FYE 12/31/86): $3 million (INPUT estimate)

a. Products/Services

- Trans Tech Services provides operations planning and control systems for the transportation industry and private carriers.

- The ROUTE/Control system is designed to help private fleets plan and control daily operations, reduce operating costs, and increase labor efficiency and equipment utilization. The system includes work stations, a routing and scheduling process, and a computer-generated road map of the service territory.

- The ROUTE/Control system is based on Trans Tech's DISPATCH/Control system, designed for the common carrier industry. The system enables management to plan and control the daily functions of delivery operations, customer service, delivery routing and scheduling, and communication with drivers.

b. Markets Served

- Trans Tech provides services to the transportation industry, including private fleets and common carriers.

c. Company Strategy

- Trans Tech provides expert systems used to solve transportation problems.

d. Recent Activities

- In 1985, TRW increased its equity position in Trans Tech Services to 20%, making TRW the largest shareholder of the company.

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e. Future Directions

- Trans Tech plans to target air freight couriers, such as Federal Express and DHL, for their future products and services.

8. McDONNELL DOUGLAS INFORMATION SERVICES GROUP
TRANSPORTATION SYSTEMS COMPANY (P.O. Box 516, St. Louis, MO 63166)
Revenue (FYE 12/31/86): $13 million (INPUT estimate)

a. Products/Services

- The Freight Rating and Routing System (FRRS) is an applications software product that allows users to store, maintain, and retrieve freight rates and routes. The system includes least-cost carrier determination and analysis. A summary function calculates the proper rates and charges including carrier discounts.

- The Freight Bill Audit System allows users to audit and correct erroneous freight bills prior to payment. The system interfaces with FRRS, producing prerated entries for the data base. In addition, management reports can be produced with the system.

b. Markets Served

- The transportation services segment of McDonnell Douglas Information Service Group markets its applications software to railroads and other companies distributing products. The company targets shippers that want to integrate corporate logistics with their systems, including inventory control, purchasing requirements, and order entry.

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c. Company Strategy

- The strategy of McDonnell Douglas Information Systems Group is to provide computer services to industries in which it can meet a specific need. In the area of transportation services, the company provides software products running on IBM mainframe computers for transportation and other companies distributing products.

d. Recent Activities

- In 1986, Version 4 of McDonnell Douglas' Freight Rating and Routing System was introduced.

e. Future Directions

- McDonnell Douglas has made no announcements involving new products or services for the transportation industry. The company will, however, continue to develop enhancements, such as the addition of new modules, for its current products.

9. NATIONAL DATA CORPORATION (One National Data Plaza, Corporate Square, Atlanta, GA 30329)
Revenue (FYE 5/31/86): $142.8 million

a. Products/Services

- National Data Corporation (NDC) provides specialized data processing and facilities management services. NDC's primary services include cash management, credit card, health care, and telemarketing processing and professional services.

- NDC has facilities management agreements with major airline and oil companies under which NDC manages and operates the complete credit card

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programs for these companies. Services include new acccount processing, credit and collection, customer billing, remittance processing, accounts receivable accounting, preparation of management information and statistical reports, and other related administrative services.

b. Markets Served

- NDC provides services to a wide range of industries, including banking, retail, medical, airlines, petroleum, telecommunications, and the federal government.

c. Company Strategy

- The company will be concentrating on business involving recurring transactions from its Credit Card, Cash Management, Health Care Data, and Telemarketing Services groups.

d. Recent Activities

- NDC has recently made the decision to prune services, such as timesharing services, that do not fit into its overall strategy.

e. Future Directions

- NDC has developed an electronic processing capability and microcomputer-based turnkey product to complement its growing presence in voice processing.

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10. AMTRAK (400 N. Capitol Street NW, Washington, D.C. 20001)
Revenue (FYE 12/31/86): $1-2 million (INPUT estimate)

a. Products/Services

- Amtrak's Automated Reservation System (ARROW) is an applications software product developed for passenger railroad operations. The system is avilable for IBM computers. Features of the system include:

  - Train availability and inventory status.
  - Fare quotations.
  - Seat and accommodation sales status.
  - Direct reference information.
  - Multiple manifest listings.
  - Passenger data retrievals.
  - Point-of-sale capabilities.
  - Automatic ticketing and payment verification.
  - Operation maintenance reporting.
  - Daily cash management reporting.
  - Real time schedule change function.

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b. Markets Served

- Amtrak markets its ARROW system to passenger railroad companies and other businesses that require reservations capability, including hotels and motels.

c. Company Strategy

- Amtrak, like many transportation companies, is looking at new ways to generate revenue other than its traditional avenue of providing transportation services. Over the years, the company has developed many applications for its own internal use and is now looking at the possibilities of marketing these applications externally.

d. Recent Activities

- Amtrak's corporate development group recognized opportunities in marketing computer services originally developed for in-house use and has issued licensing agreements for some of its applications.

e. Future Directions

- The company will establish an arm for marketing its applications externally. This marketing function will access marketing opportunities for various products and services and look at opportunities in other industries.

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IV INFORMATION SYSTEMS DEPARTMENT ISSUES

A. MAJOR ISSUES

1. ISSUES AND OBJECTIVES

- Key issues for transportation company IS departments include cost control, accessing better information more quickly, and new technology.

  - Cost control.

    . IS managers are faced with trying to keep personnel costs down while improving programmer productivity.

    . Cost and revenue measurements are critical in maintaining profitability.

  - Data communications and integrated systems.

    . Unique to the transportation industry is the need to communicate with many remote, moving sites such as trucks, buses, ships, trains, and airliners.

    . Because there are so many points of transaction in the transportation business, timely information exchange between these

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companies and their customers is important. Information exchange would include electronic transfer of data for billing, orders, and routing.

. Management needs to be able to access information, make decisions, and communicate rapidly.

- Changing technology.

. As systems become more complex, the ability to increase capacity and make system modifications becomes increasingly complex.

. IS managers want to know what hardware, including communications equipment, will be viable in the long run and remain cost effective.

- Objectives are focused on profitability and remaining competitive. They include:

  - Reducing costs, including equipment maintenance and personnel costs.
  - Increasing programmer productivity.
  - Improving data transfer among remote sites, customers, and management.
  - Integrating systems.
  - Installing new hardware.
  - Developing new applications.

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- Key issues and objectives for IS managers in the transportation industry are shown in Exhibits IV-1 and IV-2.

2. IMPACT OF NEW TECHNOLOGY

- Advances in technology provide communications capability with operating entities such as trains, buses, ships, and airliners, as well as with branch offices, customers, and management.

  - Telecommunications provides the capability to control operations at the vehicle level.

  - Computerized reservation systems allow seat discounting and improved loading.

  - Increased use of microcomputers as part of a computerized network provides more timely cost and revenue information to management.

- As the unit cost of collecting and transmitting data decreases, more information can be collected at the point of transaction. Since in the transportation industry there are so many locations involved, being able to transmit and collect information to and from these points is critical in decision support for cost effectiveness, profitability, and competitiveness.

- The impact of new technology is outlined in Exhibit IV-3.

B. NEW APPLICATIONS

- In the area of new applications planned for IS departments in 1987, 54% of the new applications projects identified by respondents involve external development resources paired with either internal development staff, an application product, or both (see Exhibit IV-4).

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EXHIBIT IV-1

TRANSPORTATION
KEY ISSUES

- Cost Control/Profitability
- Data Communication between Remote Sites, Customers, and Management
- Availability of Integrated Systems
- Future Directions in Technology

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EXHIBIT IV-2

TRANSPORTATION OBJECTIVES

- Reduce Costs
- Increase Programmer Productivity
- Improve Data Communications
- Implement New Computer Systems
- Develop New Applications
- Integrate Systems

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EXHIBIT IV-3

TRANSPORTATION
IMPACT OF NEW TECHNOLOGY

- Competitive Advantage through Higher Productivity and Lower Costs
- Access to Information from All Parts of Integrated System
- Communication with Remote Sites, Customers, and Management

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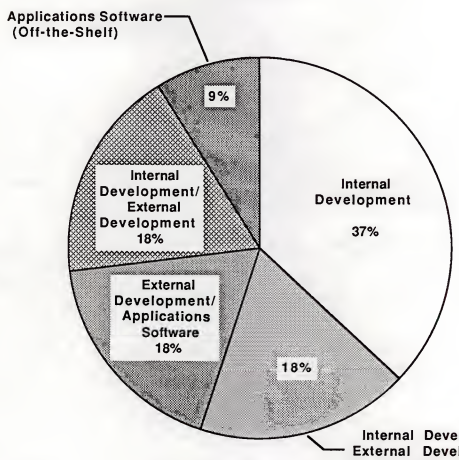
EXHIBIT IV-4

TRANSPORTATION
SOURCE OF DEVELOPMENT FOR NEW APPLICATIONS



Percent of Responses

Cost Range: $18,000 - $2.0 Million

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- New applications requiring only internal development resources accounted for 37% of the responses.

- Only 9% of new applications planned include off-the-shelf applications software alone. These included cross-industry applications such as financial reporting software and general ledger and accounts receivable software.

- Very few industry-specific external products and services, including processing services, turnkey systems, professional services, and applications software products, were purchased in 1986.

- According to respondents, 45.5% of applications development personnel are assigned to the development of new systems, 31% are assigned to the maintenance of existing systems, and 23.5% are assigned to the enhancement of existing systems (see Exhibit IV-5).

- The most important cross-industry and industry-specific applications respondents will be implementing in 1987 are shown in Exhibit IV-6. In addition to those applications, the following were also identified:

  - Installation of a communications network linking minicomputers at agency sales locations.

  - Installation of increased mainframe processing capacity.

  - Image processing system for accounts payable that records on a laser disk.

- Implementation costs for new applications ranged from $18,000 to $2 million.

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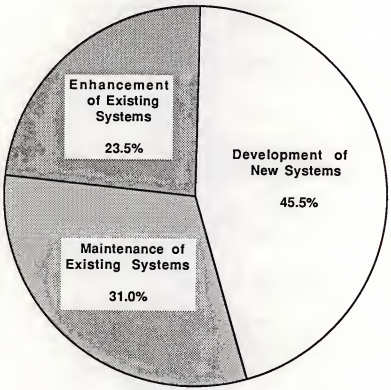
EXHIBIT IV-5

TRANSPORTATION
I.S. PERSONNEL ASSIGNED TO DEVELOPMENT, MAINTENANCE, AND ENHANCEMENT OF SYSTEMS



Percent of I.S. Personnel

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EXHIBIT IV-6

TRANSPORTATION
NEW APPLICATIONS FOR 1987

Most Important Applications

- General Ledger/Accounts Payable
- Financial Reporting System
- Revenue Allocation System
- Materials Management System
- Project Tracking and Management System
- Railcar Accounting System
- Aircraft Parts Inventory Tracking System
- Yield Management System for Airline Reservations

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C. BUDGET ANALYSIS

- Expected growth for IS budgets in 1987 averaged 10.3% for the transportation industry respondents.

- Increases in 1987 were attributed to corporate growth, the installation of new application programs, IS salary increases, and the acquisition of new computer hardware (see Exhibit IV-7).

- Decreases were generally related to hardware.

  - Some companies are purchasing rather than leasing equipment.

  - Some are purchasing new equipment with one-year service warranties to reduce maintenance costs for the year.

  - Some are moving to third-party maintenance providers to cut costs.

- Companies with budgets remaining the same reported that personnel and equipment costs had to be held constant due to a decline in business.

- As shown in Exhibit IV-8, 60% of respondents are increasing IS budgets in 1987, budgets remain the same for 30% of respondents, and for 10% of respondents, budgets are decreasing in 1987.

- For respondents increasing IS budgets in 1987, 50% will increase at the same rate as in 1986, 33% will increase at a rate lower than in 1986, and 17% will increase at a rate higher than in 1986.

- IS budgets for transportation industry respondents averaged 1.5% of total corporate revenue in 1986.

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EXHIBIT IV-7

TRANSPORTATION
INCREASING 1987 I.S. BUDGETS

- Corporate Growth
- Installation of New Application Programs
- Wage Increases
- New Equipment Acquisitions

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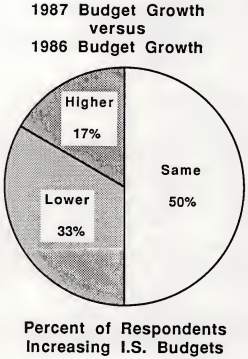
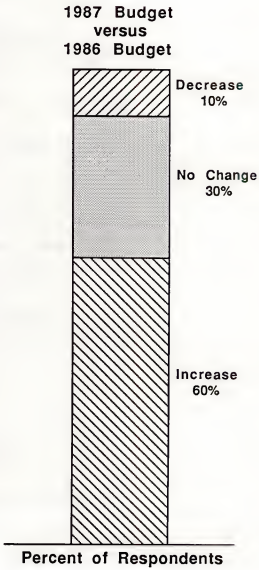
EXHIBIT IV-8

TRANSPORTATION
MOST BUDGETS WILL INCREASE AT THE SAME RATE AS IN 1986





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- Respondents reported that total corporate IS expenditures included the corporate IS budget as well as other IS organizations within the company. Responses showed that the corporate IS budgets represent, on average, 90% of total corporate IS expenditures, while other IS organizations' expenditures represent the remaining 10% (see Exhibit IV-9).

- Exhibit IV-10 shows the 1986 budget distribution and projects the growth of budget categories in 1987.

- The largest projected growth categories in 1987 are personnel, mainframes, and data communications.

  - Personnel are required for internal applications development.

  - Mainframes are required to provide processing that is being moved in-house.

    . For those transportation industry respondents that have been using outside processing services, there is a trend to move these types of services in-house.

  - Data communications are required for the type of connectivity that transportation companies are looking for. In fact, connectivity is the most important issue that information service vendors can address at present.

    . Transportation companies want to link vehicles and depots to corporate offices and sales locations to corporate headquarters.

    . Electronic data interchange (EDI) can be used to transmit shipment and delivery information to carriers providing intermodal transportation.

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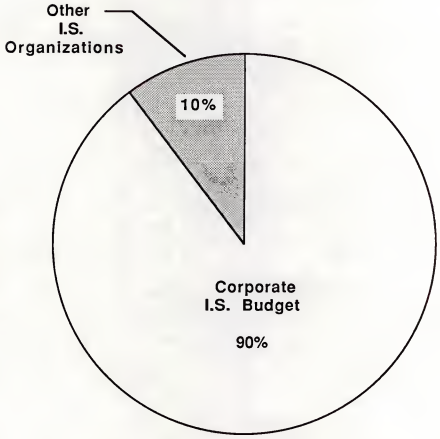
EXHIBIT IV-9

TRANSPORTATION
TOTAL CORPORATE I.S. EXPENDITURES



Percent of Total Corporate I.S. Expenditures

MSPA-TRJz

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EXHIBIT IV-10

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE TRANSPORTATION SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	47.2%	10.2%
Mainframe Processors	14.9%	16.4%
Minicomputers	1.1%	8.5%
Microcomputers	1.3%	7.1%
Mass Storage Devices	.7%	0.0%
Total Hardware	18.0%	21.6%
Data Communications	4.9%	9.6%
Voice Communications (If Part of I.S. Budget)	17.9%	2.5%
Total Communications	22.8%	4.0%
Professional Services	0.4%	8.4%
Processing Services	0.4%	-86.4%
Applications Software	0.7%	3.1%
Systems Software	3.0%	6.6%
Turnkey Systems	0.5%	0.0%
Total External Services/ Products	5.0%	-1.8%
Other	7.0%	11.1%
Total All Categories	100.0%	10.3%

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- Transportation companies will be looking at private and public networks accessed via phone lines and satellite dishes. (However, some projected future technologies, such as installing satellite dishes on trucks, have met with initial skepticism.)

- Transportation companies typically dedicate a significant portion of IS resources to data communications because of the diverse nature of the industry.

- The respondents in the transportation sector reported that software and hardware maintenance was either bundled into the cost of the software/hardware or provided by their own staff.

  - In a few cases, the respondents will be changing over to third-party maintenance providers for hardware and software support to effect cost savings in 1987.

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V NEW OPPORTUNITIES

A. INTEGRATED SYSTEMS

- An excellent opportunity for information services vendors providing systems for the transportation industry lies in integrated systems that combine several industry-specific applications. For example, the trucking industry uses integrated systems that combine vehicle maintenance, parts inventory, preventive maintenance, scheduling, mechanic statistics, repair orders, and fuel and mileage reporting.

- Transportation companies also require systems that provide cross-industry type applications such as accounting, financial reporting, payroll, human resource management, inventory control, and planning and analysis, which are tailored to meet their industry segment specifications and are integrated with very industry-specific applications related to their particular market niches.

B. COMMUNICATIONS

- Many opportunities are opening up for transportation industry information services in the area of data communications. Electronic data interchange (EDI), local area networks (LANs), and satellite communications provide the means for applications to be brought down to the vehicle level and for information to be transmitted to and from the appropriate points.

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- Leaseway Transportation utilizes EDI along with materials tracking and decision support systems to provide Just-in-Time delivery services. In addition, Leaseway has developed a truck-line management program for a 3Com local area network (LAN) called the Logistics Resource Toolbox of Solutions. The system was designed to automate every planning task performed by a trucking operation. It tracks the status of vehicles, orders, and loads, which speeds up the truck-dispatching process by reducing paperwork and eliminating repetitive work.

- Federal Express is the only air express company with its own satellite communication system, allowing efficient response to its customers' needs. In addition, the company utilizes an advanced management information system that pinpoints a package's location from pickup to delivery, and a courier dispatch system that employs microcomputer terminals in its vans.

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VI CONCLUSIONS AND RECOMMENDATIONS

- Information service vendors targeting the transportation sector need to provide systems that center on containing costs, increasing the productivity of IS and other personnel, and improving the efficiency of transportation systems in order to assist their transportation customers in effectively competing in a dynamic deregulated operating environment.

- Information systems need to address the specific requirements of particular market niches within the transportation sector. Examples of niches are less-than-truckload (LTL) trucking operations, railroads carrying ship containers piggyback, and airlines offering significant discounting.

  - Rates for (LTL) shipments run about three times truck load freight shipments, making LTL business an excellent segment of the market in which to operate. LTL business requires an expensive network of shipping terminals serving a modern truck fleet through the use of computer systems.

- In addition, the systems should enable transportation companies to offer their customers additional services which are clearly recognizable to these customers as a benefit. Examples of these types of systems include the following:

  - Leaseway Transportation developed a mainframe system for internal use called Route Assist, which analyzes orders, loads, destinations, and

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mileages and develops optimal truck routes for a given set of customers. The company has now developed a route-planning program for PCs and is using the system as a marketing tool.

- Trucking companies and railroads are using instant price quotation systems and systems that pinpoint the exact location of shipments to sell their services.

- In an attempt to compete with United Parcel Service in the small package business, Roadway Services is providing additional services to its customers. The company's sorting terminals are equipped with overhead lasers that scan the bar codes on every package as it passes on the conveyor belt. Customers can call to get up-to-the-minute tracking reports from a computer.

- Transportation company management want systems that integrate cross-industry applications, such as accounting and financial reporting, inventory control, payroll, human resource management, and planning and analysis applications, with very industry-specific applications so that they will have complete up-to-date information available to make decisions on a timely basis.

- In addition, data communications is especially important to the transportation sector because of the many points of transaction involved and the mobile nature of the industry.

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APPENDIX TR-A: FORECAST DATA BASE: TRANSPORTATION SECTOR

- This appendix contains the following forecast information, as shown in Exhibits TR-A-1 through TR-A-5:
  - Transportation industry sector market size by delivery modes for each year 1985-1991.
  - Transportation industry sector market growth rates for 1985-1986.
  - Transportation industry sector average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.
  - Market sizes by delivery mode, 1985-1986 market growth rates, and AAGRs for the period 1986-1991 are also presented for transportation industry segments including airlines, railroads, trucking, and other transportation.

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TRANSPORTATION INDUSTRY SECTOR
INDUSTRY-SPECIFIC USER EXPENDITURE FORECAST
1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	CAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	190	10%	209	230	254	309	365	427	15%
FACILITY MANAGEMENT	26	4%	27	28	30	31	33	34	5%
TOTAL PROCESSING SERVICES	216	9%	236	258	284	340	398	461	14%
APPLICATION SOFTWARE									
MAINFRAME/MINI	110	20%	132	158	178	228	274	328	20%
MICRO	22	41%	31	47	65	81	99	119	31%
TOTAL APPLICATION SOFTWARE	132	23%	163	205	235	309	373	447	22%
TURNKEY SYSTEMS	120	21%	145	171	206	248	300	358	20%
SECTOR TOTAL	468	16%	544	634	725	897	1071	1266	18%

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TRANSPORTATION INDUSTRY SECTOR
AIRLINE

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	19	11%	21	23	25	30	35	41	14%
APPLICATION SOFTWARE	13	23%	16	20	24	31	37	44	22%
TURNKEY SYSTEMS	11	18%	13	16	19	23	28	33	20%
TOTAL	43	16%	50	59	68	84	100	118	18%

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TRANSPORTATION INDUSTRY SECTOR
RAILROAD

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	17	6%	18	20	22	25	29	33	13%
APPLICATION SOFTWARE	11	27%	14	18	21	28	34	41	24%
TURNKEY SYSTEMS	16	20%	12	14	17	20	24	29	19%
TOTAL	38	16%	44	52	60	73	87	103	19%

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TRANSPORTATION INDUSTRY SECTOR
TRUCKING

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	137	9%	150	164	187	217	254	299	14%
APPLICATION SOFTWARE	82	23%	101	127	146	191	231	277	22%
TURNKEY SYSTEMS	75	21%	91	107	129	156	189	226	20%
TOTAL	294	16%	342	398	462	564	674	797	18%

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TRANSPORTATION INDUSTRY SECTOR
OTHER

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	CAGR 86-91
PROCESSING SERVICES	43	9%	47	51	60	68	80	93	15%
APPLICATION SOFTWARE	26	23%	32	40	49	59	71	85	22%
TURNKEY SYSTEMS	24	21%	29	34	41	49	59	70	19%
TOTAL	93	16%	108	125	145	176	210	248	18%

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APPENDIX TR-B: 1985/1986 FORECAST RECONCILIATION

- This appendix contains the reconciliation of INPUT's 1985 transportation industry sector forecasts for the period 1985-1990 and the 1986 forecasts shown in this report (see Exhibit TR-B-1).

- The primary discrepancy between 1985 and 1986 forecasts is in the AAGR from 1986-1991 for applications software. The average growth rate has been changed from 42% per year during the period 1985-1990 to 22% per year during 1986-1991. Reasons for the change include the following:

  - Growth in the applications software market has peaked during the last two years.

  - Pricing for applications software, in general, has decreased.

  - The transportation industry sector has experienced a high level of acquisition and merger activity in the past year, resulting in shared, internally-developed resources. Applications that are developed for internal use by a transportation company are not included in INPUT's information services market forecasts.

  - The decision time for makings application software purchases appears to have increased over the last few years due to the confusion over the number of software packages offered.

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TRANSPORTATION - DATA BASE RECONCILIATION
OF MARKET FORECAST
BY DELIVERY MODE

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1990 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	190	190	0%	475	427	11%	20%	15%
FACILITY MANAGEMENT	26	26	0%	33	34	-3%	5%	5%
TOTAL PROCESSING SERVICES	216	216	0%	508	461	10%	19%	14%
APPLICATION SOFTWARE	132	132	0%	763	447	71%	42%	22%
TURNKEY SYSTEMS	123	120	3%	305	358	-15%	20%	24%

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- In some cases, little or no profits have resulted in having less to spend on information services overall.

- Decreased profits for some transportation companies were the result of the international political arena. For example, airlines were affected by terrorist activities.

- Transportation companies 1987 IS budgets show a high increase in spending for personnel, mainframes, and data communications than for applications software.

- Note that the applications software market for the transportation sector is forecast at $447 million in 1991, representing the largest market by delivery mode at that time. Much opportunity exists for applications software vendors targeting the transportation industry sector.

- An adjustment was also made for slowed growth in remote computing and batch processing services in the 1986 report as more processing is moved in-house.

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U.S. INFORMATION SERVICES
VERTICAL MARKETS, 1986-1991
UTILITIES SECTOR

DECEMBER 1986

U.S. INFORMATION SERVICES VERTICAL MARKETS, 1986-1991
UTILITIES SECTOR

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U.S. INFORMATION SERVICES VERTICAL MARKETS, 1986-1991
UTILITIES SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. DEFINITIONS AND APPLICATIONS

- INPUT divides the utilities market into three major segments:
  - Electric.
  - Gas.
  - Water and sewage/waste disposal.
- Telephone and telecommunications utilities are discussed in the telecommunications section.
- Electric utilities are divided into five classifications:
  - Investor-owned (those utilities with publicly traded stock).
  - Cooperatives.
  - Municipality-owned.
  - Federal-owned.
  - State projects/power districts.

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- The three primory types of gas utilities ore:
  - Tronsmission.
  - Distribution (locol gos utilities).
  - Municipol componies.
- Woter utilities ore divided into:
  - Public or municipality ownership.
  - Private ownership.
- "Sewoge ond woste disposol services" completely describes this market segment.
- Administrative computing applicotions encompass:
  - Utility billing.
  - Customer service.
  - Cost ollocation services.
  - Property records.
  - Inventory monagement.
  - Monagement reporting.
  - Cash monogement.

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- Route management and analysis.
- Meter reading.

- General "operations" computing applications include:
  - Outside plant mapping.
  - Process monitoring and control.
  - Simulation of system usage.
  - Construction and contracting.
  - Equipment fault/success analysis.
  - Pipe network engineering.

- Specific electric utility operation computing applications include:
  - Piping layout and analysis.
  - Network configuration and analysis.
  - System state measurements, calculations, and analysis.
  - Switching-surge insulation performance assessment.
  - Load loss statistical calculations.
  - Schedules for thermal unit and gas turbine operations.
  - Electrical system topology.
  - Generating capacity planning.

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- Gas utility operations computing applications include:
  - Gas supply balancing.
  - Pressure/flow simulation.
  - Capacity planning.
  - Inside plant mapping.
- Water/waste utility operations computing applications encompass:
  - Pressure/flow simulation.
  - Inside plant mapping.
  - Capacity planning.
  - Environmental hazards monitoring and reporting.

B. ISSUES

- Utilities' computer usage is diverse. The use of computers for financial and administrative applications differs significantly from computer systems used for operations.
  - Financial and administrative applications software combines business-oriented information with state and federal regulatory compliance.
  - Computer systems used in the operations side of utilities combine real time process and control applications with engineering and technical simulations.

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- As a result, few hardware vendors can provide a single hardware system to meet utilities' data processing requirements.

- Electric utilities experience increased competition from gas utilities selling alternative energy sources and some large commercial customers who have installed cogeneration systems. Therefore, electric utilities are developing data bases of customer information to improve marketing efforts.

- Large public utilities that are under less severe cost pressures have issues and objectives encompassing data administration, formalizing end-user support organizations, and taking a more active role in the corporate planning process.

- The purchase of departmental minicomputers and fourth generation application development tools by end-user departments is changing IS' role to one of data manager and coordinator. Additionally, corporate IS can continue to help with cost justification of systems for end-user departments.

- Utilities have always dealt with government regulations. However, "enlightened" utilities are learning to work with regulatory agencies in an effort to get necessary rate increases approved and receive these increases in a timely manner. Under the Reagan administration, the regulatory environment may have lessened somewhat.

- Interest rates directly affect utility operating costs. The high interest rates of the early 1980s dramatically increased the cost of capital for necessary improvements and plant additions and especially slowed the building of nonnuclear facilities.

- As a result of decreasing oil prices since 1984, fuel oils offer strong competition to gas and electric utilities as alternate fuel sources. For new construction, builders and architects, through their designs, influence fuel consumption patterns in the short run by selecting one fuel source over another.

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- Hardware and software obsolescence will impact many utilities. Basic commercial applications (billing, financial reporting, accounts payable, accounts receivable) need to be upgraded and integrated.

  - New billing and payment systems that take advantage of technological advances such as pay-by-phone and frequency emitting meters are being developed.

  - Engineering and operation systems are being integrated with modeling systems to project capacity requirements.

- Administrative software modules are being integrated where one keystroke can transfer the data entered to all system modules requiring that information. Dividing a large application into smaller modules also breaks a high value sale into a series of smaller ticket sales, a valuable marketing tool for an industry with tight data processing budgets.

- Senior management at utility companies, selected generally for good day-to-day operations backgrounds, are beginning to use information as a competitive and strategic weapon.

- Growth will occur in:

  - Mainframe- and minicomputer-based operations and technical applications.

  - Microcomputer-based business and operations applications.

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C. TRENDS IN ELECTRIC UTILITIES

- Readily available excess electricity, made possible by cogeneration, has three interrelated effects:
  - It has lessened the need to expand capacity.
  - It has led to increased selling and buying of excess electricity.
  - It has led to increased competition in selling electricity to municipalities and large industrial customers.
- For the past two years, cost overruns in nuclear power plant construction have forced budget austerity. These budget cuts have affected the rate at which IS management has purchased or written software for new applications.

D. TRENDS IN GAS UTILITIES

- Conservation efforts, begun in the 1970s, indelibly changed the natural gas industry. Industrial consumption of natural gas, which decreased 20% since 1973 for commercial customers, will decrease 5% per year through 1991.
- Fortunately, this decrease is offset by the steady increase in natural gas usage among the natural gas industry's top three users--retail trade, real estate, and service organizations. Natural gas consumption by these three market segments, accounting now for 50% of total U.S. gas consumption, is expected to grow by 5-10% annually through 1991.
- The overall share of natural gas sold to commercial accounts under "special conditions" (i.e., at a discount) has decreased from 42% to 39% of total natural gas consumption, a positive trend for the gas industry.

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- Programs for recycling refuse into natural gas have begun and are successful on a relatively small scale. The technology challenge is to economically increase the scale and scope of refuse conversion.

- Declining prices for natural gas and oil have resulted in reduced industry profits; hence, further pressure on IS to curtail or delay capital spending. Alternative fuels such as low- and high-sulphur heating oil are less expensive. Therefore, users tend to purchase these fuels before natural gas.

E. TRENDS IN WATER AND WASTE UTILITIES

- Demand will steadily increase through 1991 by homes and industry for water and waste services.

- Hazardous waste disposal and monitoring is becoming a more important application as a result of the current level of interest by state and federal legislatures and the public.

F. EVENTS

- Public utilities (i.e., those with stockholders) are diversifying their business base to lessen earnings dependence on a single business. INPUT has identified the following diversification targets: real estate development, venture capital, financial services, retailing, and computer services.

- In 1986, Pacific Lighting (Los Angeles, CA) acquired drug store chain Thrifty Corporation (Los Angeles, CA).

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- Portland General Electric (Portland, OR) has entered into real estate ventures (with Weyerhaeuser Corporation of Tacoma, WA), airplane leasing, and venture capital.

- Philadelphia Suburban Corporation (holding company for Philadelphia Area Water Company) acquired two computer software and services firms:

  - Stoner Associates, Inc. (Carlisle, PA), a supplier of applications software for the utility market utilizing Prime minicomputers and IBM mainframes, was acquired in January 1985.

  - Philadelphia Suburban Corporation also acquired Digital Systems, Inc. (Columbia, SC), a supplier of DEC-based turnkey systems to electric/gas/water/waste utilities.

G. FACTORS LIMITING GROWTH

- Factors that have held back growth in the utility information services market include:

  - Operations-oriented, rather than strategic-oriented, senior management that emphasizes cost cutting as opposed to using information as a competitive weapon or service differentiator.

  - Mainframe-based, batch-oriented administrative and financial software has been insufficient to accomplish basic tasks, consequently lessening the demand for more costly industry-specific solutions.

  - Sales of minicomputer-based turnkey systems for plant operations, which do not have integrated hardware or software increased rapidly following the problem at Three Mile Island but have slowed considerably in the past two years.

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H. FACTORS SPURRING GROWTH

- Automation of repetitive tasks, such as meter reading, happened slowly in the utility business. Recently, utilities are adopting widespread usage of hand-held meter reading devices, which can automatically check for validity of data, store the data from hundreds of readings, then forward the data to the accounting mainframe for processing customers' bills.

- Industry associations for electric, gas, and water/waste utilities are increasing their roles by adding on-line data bases through the association's computer or public on-line data bases, which include information on:

  - Rates.
  - State government elected representatives.
  - Federal government lawmakers and regulatory agency personnel.
  - Population demographics.
  - Business demographics.
  - Status on key legislation.
  - Headlines and news briefs from industry periodicals.
  - Federal energy regulations.

- Microcomputer-based applications, especially those designed for utility districts serving 40-500 customers, will spur sales of computer software.

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- Increases in the number of computer simulations, already proven cost-effective, will increase demand for specific applications available on supercomputers or the new minisupercomputers. Since each supercomputer system costs more than $15 million, processing/network services that sell time to users on these systems represent more cost-effective solutions than user purchase of the hardware and software.

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II MARKET FORECASTS

A. INTRODUCTION

- INPUT divides the utility market into three segments:
  - Electricity.
  - Gas.
  - Water and waste disposal.
- The SIC (Standard Industrial Classification) for this market sector is 49 (491-497), which includes:
  - Electric services.
  - Gas production and distribution.
  - Combination electric and gas and other services.
  - Water supply.
  - Sanitary services.

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- Steam supply.

- Irrigation systems.

- The number of utility companies in the U.S. in 1986 is shown in Exhibit II-1 and the number of utility company employees as of 1983 is depicted in Exhibit II-2. All but 2,000 utilities (privately-owned water utilities) are candidates for some level of computerization. These 2,000 privately-owned water companies, generally located in rural areas and serving less than 40 customers each, are sufficiently small that computerization may be uneconomical.

- The utility market appears relatively homogeneous. Information requirements for administrative computing at electric utilities should be similar to those of gas or water/waste utilities. Operations computing requirements are fundamentally similar, the key exception being government reporting requirements for electric utilities with nuclear power plants.

- In reality, a utility is built around its people. No two utilities approach the business in the same manner. As a result, some level of software customization is always required.

- Demand for industry-specific utility applications will grow 13% annually through 1991, increasing from $262 million to $537 million. User expenditures are shown in Exhibit II-3.

B. DEMOGRAPHIC FORECAST

- As a result of merger activity, the number of electric utilities will decline slightly between 1986 and 1991.

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EXHIBIT II-1

NUMBER OF UTILITIES IN U.S. BY TYPE
1986

TYPE	NUMBER OF UTILITIES
ELECTRIC*	
• Investor Owned	218
• Cooperatives	1,055
• Municipalities/Publicly-Owned	1,900
• Federal-Owned	9
• State Projects/Power Districts	91
Total - Electric Utilities	3,273
GAS**	
• Transmission	150
• Distribution (Utilities)	450
• Municipal Companies	750
Total - Gas Utilities	1,350
WATER†	
• Public/Municipalities	18,000
• Private Ownership	6,000
Total - Water Utilities	24,000
SEWAGE AND WASTE DISPOSAL††	
• Sewage Services	5,000
• Combined Services	340
Grand Total	33,963

* Source: Edison Electric Institute
† Source: National Association of Water Companies
** Source: American Gas Association
†† Source: Sales and Marketing Management Magazine

MSPA-UT S

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EXHIBIT II-2

NUMBER OF EMPLOYEES BY TYPE OF UTILITY, 1986

UTILITY	TOTAL EMPLOYEES
Electric	686,000
Gas (Production and Distribution)	230,000
Combination Utility Services	110,000
Water	105,000
Sanitary Services	55,000
Total	1,186,000

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EXHIBIT II-3

UTILITIES INDUSTRY SECTOR
INDUSTRY-SPECIFIC USER EXPENDITURE FORECAST, 1986-1991

SEGMENTATION BY DELIVERY MODE	($ M) 1985	85-86 Growth	($ M) 1986	($ M) 1987	($ M) 1988	($ M) 1989	($ M) 1990	($ M) 1991	AAGR 86-91
Processing Services									
Remote Computing/Batch	$108	8%	$117	$126	$137	$150	$165	$181	9%
Facility Management	20	5%	21	23	25	28	33	38	13%
Total Processing Services	$128	8%	$138	$149	$162	$178	$198	$219	10%
Applications Software									
Mainframe/Mini	$75	11%	$83	$91	$100	$110	$129	$152	13%
Micro	33	18%	39	47	58	71	90	115	24%
Total Applications Software	$108	13%	$122	$138	$158	$181	$219	$267	17%
Turnkey Systems	$26	12%	$29	$32	$36	$40	$45	$51	12%
Section Total	$262	10%	$289	$319	$356	$399	$462	$537	13%

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- Competition from alternate power sources, such as wind and solar, will force electric utilities to become even more efficient.

- Effective utilization of existing facilities may require some consolidation to meet changing economies of scale.

- To meet these new economies of scale, most mergers and consolidations will be among small- and medium-sized electric utilities.

- The consolidated utilities will be located near one another and may serve customers in more than one state.

- The number of gas utilities will remain relatively constant, assuming very few mergers among medium and smaller gas utilities.

- The number of water districts will also remain constant, assuming a minimum of merger and acquisition activity.

- The number of combined sewage and waste disposal operations will hold steady for the next five years since these operations are also relatively mature businesses.

C. ELECTRIC UTILITIES

- Although there are only about 3,000 electric utilities, expenditures for software and services by this segment accounts for approximately 55% of total utilities data processing expenditures.

- The administration and accounting functions at the largest public electric utilities (i.e., utilities with publicly traded stock) are heavily mainframe-based, batch processing-oriented. Large electric utilities, which have been

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converting to on-line transaction-oriented customer service systems, account for approximately 40% of total utilities data processing expenditures.

D. GAS UTILITIES

- Information services expenditures by the 1,350 gas utilities account for 25% of total utility sector IS expenditures.

- Production of synthetic natural gas (SNG) or methane from garbage and other waste materials is increasing the available supply of natural gas.

  - More production and monitoring hardware and software will be necessary to support this burgeoning technology.

  - More applications software for simulating SNG plant design and transportation and storage will be required to support utilities. Furthermore, the growing number of municipalities determining the feasibility of converting effluent from waste water treatment to methane require software to aid in their analyses.

- Gas utilities will install improved gas transportation and storage monitoring hardware and software.

E. WATER, SEWAGE, AND WASTE DISPOSAL UTILITIES

- Similar to other utilities, water and waste utilities must improve asset management. Software to help allocate people, vehicles, heavy equipment, and computers and yielding an immediate, measurable return is desirable.

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- Individual applications not requiring interface with the administrative mainframe or minicomputer will increasingly run on a PC.

F. PROCESSING SERVICES

- As more organizations convert from minicomputer- to microcomputer-based solutions, processing services will grow more slowly than overall computer services in the utilities market.
  - Note, however, that INPUT's IS spending forecast does not portend a negative growth rate. Rather, it indicates slower than average growth.
  - Many utilities, satisfied with the level and quality of processing service and not willing to hire and manage staff, will maintain the status quo relationship with processing services.
  - As processing services move from batch to interactive processing and install the expensive, full-function software required to completely manage a utility, more utilities will migrate to processing services rather than compete for data processing administrative, programming, and operations staff.
- Facilities management contracts are decreasing overall due to the proliferation of minicomputer- and microcomputer-based turnkey systems. However, many medium and large utilities wanting to avoid hiring, training, and management problems will remain loyal to facilities management services.
- Concerns for safety arising out of the Three Mile Island operating problem have led to a steady increase in disaster recovery services, much of which is processing service-based.

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- To retain customers, many remote computing services now offer micro-to-mainframe communication links. This trend will continue.

G. TURNKEY SYSTEMS

- Turnkey systems, especially microcomputer-based systems, will grow faster than the overall market for three reasons:

  - Certain administrative functions, such as gas transmission analysis or vehicle maintenance management and scheduling, can be initially implemented on a microcomputer and sold as a turnkey system.

  - Existing micro-based applications can be networked or set up to run on multi-user micros or minicomputers. Turnkey systems, with single supplier accountability, represent a competitive alternative.

  - UNIX- or Pick-based technical or commercial applications, which were initially written for a minicomputer and are becoming more popular, can be easily ported to a microcomputer.

- The new 80386 microprocessor will soon open up a new class of computers offering highly competitive price/performance. While new software must be written to accommodate these machines, this is an opportunity for improved operating systems, better user interfaces, and, most importantly, integrated applications software.

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H. APPLICATIONS SOFTWARE

- Mainframe and minicomputer-based applications software will grow at slightly less than overall user expenditures for all utility-related computer services. The factors influencing the growth of the market are more important than those factors impeding market growth.

- Factors influencing the growth of mainframe/mini-based software for utilities include:

  - Integrated software modules.

  - Growth in ownership of voice and data communication facilities by large utilities.

  - More federal and state government reporting requirements.

- Factors slowing the growth in demand for mainframe/mini-based application software include:

  - Lack of organizational plans for effective utilization of computers and application software.

  - Migration of current minicomputer applications to microcomputers. However, applications migration to micros will be limited by departmental needs for shared information.

- Microcomputer-based applications software will grow fastest of all computer services delivery modes since more detailed sub-applications will initially be micro-based. Vehicle management, which includes vehicle maintenance and operation scheduling, could initially be implemented on a micro rather than an integrated module as part of the utility administrative mainframe or

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minicomputer. The growth in the number of IBM PC/XT/ATs and "lookalikes" underlie this tremendous demand.

- Large utilities are striving to install one microcomputer for every two professional employees. The growth in installed systems and the offering of site licensing by leading vendors will spur sales of micro-based software.

I. PROFESSIONAL SERVICES

- The largest utilities have implemented a number of specialized applications. In this case, the challenge is linking the processors and applications through system integration.

- Systems integration in the utility segment will be a major opportunity for vendors because:

  - Many utility districts (3,500) can effectively utilize system integration services.

  - Integration of existing systems is more cost effective than retraining users on new hardware and software.

  - Large system integration projects will start with mainframe data bases used in administrative and accounting applications, then will spread to technical applications.

  - Mainframe-based system integration projects imply a captive market for IBM services since the IBM account representative is in close contact with IS management in large utilities.

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III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The utility information systems market is characterized by:
  - Large vendors selling mainframe-based administrative software.
  - A few large and numerous small vendors selling minicomputers and microcomputer software to manage operations.
  - Less than six large processing/network vendors providing specialized information services to utilities.
- The market shares of leading vendors in the utility sector are shown in Exhibit III-1.
  - Revenues for the top ten vendors represent 51% of total sector information services revenues.
- Information services for the utilities sector can also be divided into administrative and operations computing.
- The leaders in the administration systems market segment are:

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EXHIBIT III-1

LEADING VENDORS IN THE UTILITY SECTOR
1986

VENDOR	Processing/ Networks Services	Software	Turnkey Systems	Professional Servcies	Total ($ Millions)	Percent Of Market
Energy Incorporated		$10.3	$6.5	$12.4	$29.2	11%
Babcock & Wilcox*	$17.0				$17.0	6%
GEISCO	$11.2	$3.0			$14.2	5%
Utility & Municipal Services	$12.0				$12.0	4%
Philadelphia Suburban Corporation**	$1.1	$2.6	$7.9		$11.6	4%
Quadrex Corporation			$8.8	$2.2	$11.0	4%
Equifax	$9.8	$0.8			$10.6	4%
CAP Gemini DASD				$9.5	$9.5	4%
Flow General		$5.0		$3.5	$8.5	3%
Network Computing Corporation	$8.5				$8.5	3%
TERA		$3.6	$2.3	$2.5	$8.4	3%
Total	$59.6	$25.3	$25.5	$30.1	$140.5	51%

* Formerly :UCCEL ** Combines: Stoner Associates and Digital Systems,Inc.

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- Babcock & Wilcox (formerly the processing services operation of UCCEL in Dallas (TX)).

- Utility and Municipal Services.

- Philadelphia Suburban Corporation.

- The leaders in the operations market segment are:

  - Energy Incorporated.

  - Quadrex Computer Systems, Inc.

  - GEISCO.

  - Equifax.

B. ACQUISITIONS

- Few mergers took place among information services suppliers to the utility market segment in 1985 and 1986, likely a statement that:

  - This is a relatively mature market dominated by a limited number larger profitable firms.

  - Second-tier companies have not introduced significant new products or applications that would make them attractive takeover targets.

  - Information services vendors' internally generated cash has been sufficient to fund research and development, product marketing, and customer support activities.

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- In the utility market segment for 1985 and 1986, INPUT identified two significant acquisitiions:

  - In December 1985, Babcock & Wilcox Corporation (a subsidiairy of McDermott Co.), which manufactures process control equipment for utilities, purchased the Dallas (TX) processing/network service of UCCEL Corporation for $4.8 million.

  - In 1985 and 1986, Philadelphia Suburban Corporation, the parent company of Philadelphia Suburban Water Company, acquired Stoner Associates (Carlisle, PA) and Digital Systems, Inc. (Columbia, SC). Philadelphia Suburban Corporation intends to become a major player in the utilities-based information services business.

C. FIRMS EXITING THE UTILITY MARKET

- No major vendors stopped supporting the utility market in 1985 or 1986. However, several firms which formerly received 100% of their revenues from the utility industry are broadening their focus to include other vertical applications.

  - Digital Systems, Inc. (subsidiary of Philadelphia Suburban Corporation) is targeting local and county governments in addition to the utility industry.

  - Quadrex Computer Systems (Campbell, CA) is selling turnkey systems to process industries, such as petrochemical and biological research.

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D. VENDOR PROFILES

1. ENERGY INCORPORATED (One Energy Drive, P.O. Box 736, Idaho Falls, ID 83402, (208) 529-1000)

   a. Products/Services

- Energy Incorporated (EI) sells software, services, and computer systems for power generation applications for the electrical power industry.

- The company's 26 applications software products serve three key areas:

  - Engineering (utilizes IBM mainframes).

  - Plant management (utilizes IBM mainframes).

  - Real time monitoring and control (utilizes DEC VAX and MicroVAX and Intel computers).

   b. Markets Served

- Before 1985, EI served two markets--electric power utilities and destruction of hazardous toxic and waste materials. In 1985, EI spun off the firm serving the hazardous waste material business.

- EI is now 100% focused on the electric power utility industry.

   c. Company Strategy

- EI provides a full range of software and services to the electric power industry, designed to help manage existing and new power generation plants.

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d. Recent Activities

- In 1985, EI spun off Waste-Tech Services, Inc., its subsidiary for the safe destruction of hazardous and toxic wastes.

e. Future Direction

- Energy Incorporated will emphasize its proprietary software products, consulting and risk assessment services, and real time process monitoring and control systems.

- EI will offer its monitoring and control systems on more vendors' hardware platforms.

2. EQUIFAX, INC. (1600 Peachtree Street, N.W., Atlanta, GA 30309, (404) 885-8000)

a. Products/Services

- Equifax offers a range of applications software products to the utilities industry.

- Applications software packages include:

  - Advanced Commercial Evaluation System (ACES)--commercial building energy audits.

  - Graphics software to show energy usage.

  - Utility customer information.

  - Scheduling weatherization programs for utility customers.

  - Job tracking weatherization programs for utility customers.

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b. Markets Served

- Equifax targets all utility companies, emphasizing electrical utilities.
- Sales of utility industry software represent less than 5% of corporate revenues.

c. Company Strategy

- Since nearly 95% of company revenues are derived from processing services, Equifax will continue to emphasize those services, targeting the insurance industry, which accounts for nearly one-half of corporate revenues.
- In the utility area, Equifax will add more applications for portable microcomputers and hand-held calculators.
- Equifax will offer some of its applications on mainframe computers through GEISCO processing/network services.

d. Recent Activities

- Equifax made a number of acquisitions outside the utility business.
  - Equifax formed its insurance subsidiary through acquisition.
  - The company expanded its Canada-based credit reporting and collections operation through an April 1985 acquisition.
- The company introduced additional products in the credit collections area in 1985.

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e. Future Direction

- Since all other company business segments are relatively large, INPUT expects Equifax to either grow the utility software business through acquisition or spin it off.

3. BABCOCK & WILCOX COMPUTER SERVICES (P.O. Box 10935, Lynchburg, VA 24506, (804) 385-3512)

a. Products/Services

- Babcock & Wilcox (B&W) provides processing/network services to utility companies.

b. Markets Served

- Electric power and energy industries.
- Processing/network services represent approximately 8% of 1985 corporate revenues.

c. Company Strategy

- The company's entry into processing/network services indicates its intention to become a full-line supplier of products and services to the utility industry. B&W has sold power monitoring equipment to electric utilities for many years. Processing services represent an extension of services designed to "lock in" customers.

d. Recent Activities

- Babcock & Wilcox purchased the Dallas-based processing/network service from UCCEL Corporation in December 1985.

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e. Future Direction

- B&W will offer specialized data processing services to existing customers.

4. GENERAL ELECTRIC INFORMATION SERVICES COMPANY (GEISCO)
(401 North Washington Street, Rockville, MD 20850, (301) 340-4000)

a. Products/Services

- GEISCO provides interactive, remote batch, applications software and inquiry/response processing services to the utilities market sector.

b. Markets Served

- Electric utilities.

c. Company Strategy

- GEISCO provides a full range of integrated applications software for utility billing and other commercial activities.

- GEISCO-developed software can be accessed through the company's MARK III and MARK 3000 processing/network services.

d. Recent Activities

- The company introduced modules with additional features and capabilities for its integrated utility management software.

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e. Future Direction

- GEISCO will maintain its position as a leading supplier of processing/network services and applications software to the utility industry.

5. QUADREX CORPORATION (1700 Dell Avenue, Campbell, CA 95008, (408) 966-4510)

a. Products/Services

- Quadrex Corporation's division, Quadrex Computer Systems, sells turnkey systems for plant monitoring and control and provides professional services to utilities.

- Its turnkey systems are based on Prime and Digital Equipment Corporation superminicomputers.

b. Markets Served

- Quadrex derives 80% of its revenue from utilities; the remaining 20% comes from process manufacturing industries.

c. Company Strategy

- Previously, Quadrex was a leading vendor of plant monitoring and control systems for nuclear power plants. The company is changing its direction away from utilities.

d. Recent Activities

- The company is lessening its dependence on the relatively saturated market for nuclear power plant monitoring and control systems.

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e. Future Direction

- Based on its turnkey system experience, Quadrex could increase its system integration activities.

6. GENERAL RESEARCH CORPORATION (Division of Flow General Corporation, 7655 Old Springhouse Road, McLean, VA 22101, (703) 893-5900)

a. Products/Services

- Develops and markets applications software for the utilities industry and also markets processing/network services.

- Applications software products, which run on the DEC VAX minicomputer and IBM mainframes, include:

  - Environmental Information System.

  - Occupational Health Information System.

b. Markets Served

- General Research Corporation targets the utility industry, concentrating on utilities with nuclear power generation capabilities.

- Software and network services revenues in fiscal year 1986 for General Research were approximately $21 million.

c. Company Strategy

- Provide software and services for the storage, retrieval, and analysis of information pertaining to occupational health and environmental safety.

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d. Recent Activities

- General Research introduced additional software modules for occupational health applications.

e. Future Direction

- GRC will expand its base of software, services, and supported hardware for this well-defined niche.

7. CAP GEMINI DASD (9045 North Deerwood Drive, Milwaukee, WI 53223, (414) 355-3405)

a. Products/Services

- CAP Gemini DASD provides contract progammers and consulting services to the utility market sector.

b. Markets Served

- CAP Gemini provides services to electric, gas, water, and sewage utilities.

c. Company Strategy

- CAP Gemini leverages its strengths in project management and internally-developed software to help sell to Fortune 1000 companies and large utilities.

d. Recent Activities

- The company helped many large customers implement fourth generation language applications and information centers.

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e. Future Direction

- Integrate new technologies such as CD ROM disks in service offerings.
- Maintain its existing base of contract programmers, a difficult task in light of recruiting efforts by other firms, including CAP Gemini's customers.

8. TERA CORPORATION (2150 Shattuck Avenue, Berkeley, CA 94704, (415) 845-5200)

a. Products/Services

- TERA provides computer-aided services and software products to the utility and manufacturing industries.
- The company has developed and marketed its Plant Information Management System (PIMS), an on-line system that coordinates and controls plant maintenance for the utility industry.
- PIMS operates on IBM 43XX and 30XX mainframes with MVS or DOS operating systems.

b. Markets Served

- Utilities and manufacturing firms.
- Sales to utilities represent 85% of total revenue.

c. Company Strategy

- TERA provides computer-aided services and software products to the utility and manufacturing industries.

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d. Recent Activities

- In 1985, TERA discontinued manufacturing and marketing its wind energy system to concentrate its resources on the utilities and process manufacturing industries.

e. Future Directions

- TERA will increase the added value content of its services through the acquisition of computer-related products and services.

9. DIGITAL SYSTEMS, INC. (P.O. Box 12, Columbia, SC 29202, (803) 799-4094)

a. Products/Services

- Digital Systems markets and supports turnkey systems for the utility industry and local/county governments.

- Specific products include:

  - Integrated utility management, utilizing DEC VAX or PDP-11 hardware.

  - Fund and encumbrance package, based on DEC VAX or PDP-11 hardware.

b. Markets Served

- Digital Systems sells to utilities and local/county governments.

- Sales to utilities represent about 75% of total revenues.

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c. Company Strategy

- Provide a full range of products and services to the electricity/gas/water/waste utilities market.

d. Recent Activities

- Since market requirements for its products are so different, the company recently formed two divisions to sell its products.

e. Future Direction

- For 1987, Digital Systems will emphasize sales of its fund and encumbrance package to local and county governments.

10. TRES COMPUTER SYSTEMS, INC. (Division of Control Data Corporation, 14801 Quorum Drive, Dallas, TX 75240, (214) 385-5800)

a. Products/Services

- Tres Systems provides applications software and professional services primarily for utilities and municipalities.

- Tres' Customer Billing and Information System and its Materials Management System utilize IBM mainframe computers.

- Professional services include system design, software customization, and consulting.

b. Markets Served

- Tres Systems markets to investor-owned utilities, municipal-owned utilities, and local transportation agencies.

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c. Company Strategy

- Tres' strategy concentrates on providing a full range of services and applications software for large utilities and transportation agencies.

- To lock in customers, the company's software is full featured and contains more than 1.1 million lines of code, an accomplishment that would be hard to duplicate in a timely manner.

d. Recent Activities

- The company began emphasizing sales to transportation authorities of its Material Management package.

e. Future Direction

- Sales of its Material Management System to local transportation agencies will represent at least 20% of total revenues in 1986.

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IV INFORMATION SYSTEMS DEPARTMENT OUTLOOK

A. MAJOR ISSUES

1. DRIVING FORCES

- Administrative applications are being used to increase the efficiency of the business and administrative functions in the utilities sector.

- More utilities are using micro-mainframe links to connect personal computers with the corporate mainframe. While the utility's primary data processing is being done on mainframes, more individuals need access to relevant portions of that data. These individuals are analyzing department-specific data for use in planning or improving operations.

- As more non-DP managers in utilities have learned about the benefits of personal computers, these managers want more control of data relevant to their department. Local area networks provide the means for department managers to establish and connect departmental minicomputers with the corporate mainframe.

- The utilities sector, always a "cost conscious" business, has to maintain its lean-and-mean operating style due largely to cost overruns in the construction of nuclear power plants.

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- Readily available excess electricity, made possible by cogeneration, has greatly lessened the need to expand capacity.

- Senior management at utility companies, selected generally for good day-to-day operations backgrounds, must begin using information as a competitive weapon.

2. ISSUES AND OBJECTIVES

- The major issues and objectives addressed by the utility sector include:

  - Cost containment.

  - Hardware and software obsolescence.

  - Customer service improvements.

  - Regulatory reporting.

  - Productivity improvements through improved assets (people, cash, vehicles, facilities) management.

  - Integration of IS plan with corporate strategic plan.

  - Establishment of a data base of marketing information.

  - Increase in organizational end-user computing, with resultant change from application development to user-driven data administration.

3. MANAGEMENT PERCEPTION AND ORGANIZATIONAL ISSUES

- Management views IS as an important resource, but its main emphasis is on IS as a cost-controlling source.

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- In the past two years, some IS managers have had more management visibility and have seen their user base expand.

- IS should play a significant role in the planning process. However, the operations orientation of utilities' senior management has resulted in few true chief information officers.

  - As utilities venture into other fields, the role of the MIS director will increase commensurate with the competitiveness of the field(s) entered.

4. IMPACT OF TECHNOLOGY

- End-user computing has had a significant impact on this sector's IS department. It has broadened IS' scope and required it to become service oriented.

- A two-prong approach to data processing in utilities has resulted in very different DP impacts.

  - In larger utilities using mainframe computers, the proliferation of inexpensive micros has bypassed true departmental processing. Exchanging diskettes with necessary information is now a tradition.

  - In the medium and small utilities, cost-effective minicomputers serve as departmental (operational) processors and central administrative computers, made possible by local area networks.

- The major thrust in distributed systems development is micro-based end-user applications. An IBM PC or clone offers a very cost-effective solution to automating standalone applications.

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- Fiber optics technology is of interest to IS managers since it will permit transmission of graphics-based information due to its support of increased bandwidth.

- Merging voice and data will eventually become a reality in utilities, according to IS managers. This belief is based on the concept that voice communications costs would be reduced once voice and data are merged. IS managers are now at the planning, not implementation, stage.

5. END-USER COMPUTING

- As in other sectors, the information center (IC) has been the focal point for end-user training. The larger end-user organizations have a separate training group that performs the following functions:

  - Trains other IS personnel.
  - Develops computer-based training programs.
  - Conducts seminars for user groups.
  - Arranges vendor presentations.
  - Conducts on-site classes.
  - Conducts classes in the IC.
  - Coordinates purchases of micros.
  - Publishes in-house computing newsletters.

- End-user computing primarily centers on micro support and micro-to-mainframe applications and accounts for 5-15% of expenditures in large utilities.

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B. NEW APPLICATIONS

- The major focus of the utilities sector for applications development has shifted from accounting-oriented applications to customer-oriented and asset management systems.

- Other new asset management applications include hand-held meter reading systems and automated mapping.

- A rate refund system will be implemented by an electric utility serving a large midwestern city.

- Other specific new applications in 1986 include:

  - Customer/marketing information system.

  - Inventory control/materials management.

  - Work order control system.

  - Power distribution information system.

  - Equipment maintenance system.

C. BUDGET ANALYSIS

- In 1986, the utilities sector experienced limited growth in overall IS budgets. This was due primarily to increases in salaries and fringe benefits in some utilities. Other utilities showed significant percentage decreases in their 1986 budgets, having made a major hardware or software purchase in 1985.

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Utilities' 1987 budgets are projected to increase mainly as a result of increased expenditures for salaries and fringe benefits, data communications, and hardware maintenance.

- Exhibit IV-1 shows the 1986 user budget distribution and projects the growth of budget categories for 1987.

- Sixty-eight percent of utilities believe their IS budgets will increase or remain the same in 1987, while about one-third believe the 1987 growth rate will be lower than 1986 (see Exhibit IV-2).

- Factors contributing to increases in the IS budget include:
  - Personnel.
  - Hardware upgrades and associated software.
  - Purchasing, rather than leasing, hardware.

- Two factors will contribute to expected decreases in utilities' 1987 IS budgets:
  - Purchases of less hardware than in 1986.
  - Cost containment.

- Nearly 55% of users indicated increased headcount in the MIS department in 1986 from 1985. Of the remainder, 23% of user departments showed a decrease in headcount while 23% said that 1986 headcount remained the same.

- The IS budget in the utilities sector is dependent on overall utility rate increases which, in turn, depend on government approved rate increases. IS managers must spend a considerable portion of their time "lobbying" for whatever funding they can get, especially with austere operating budgets. As

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EXHIBIT IV-1

1986 BUDGET DISTRIBUTION AND 1986/1987 CHANGES IN THE UTILITIES SECTOR

BUDGET CATEGORY	1986 PERCENT OF I.S. BUDGET	1986-1987 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	35.1%	1.4%
Mainframe Processors	11.5%	4.5%
Minicomputers	1.4%	0.0%
Microcomputers	6.3%	6.2%
Mass Storage Devices	5.8%	(1.1%)
Other Hardware	8.1%	0.3%
Total Hardware	33.1%	0.8%
Data Communications	4.4%	11.2%
External Software	6.1%	9.8%
Professional Services	4.4%	3.2%
Turnkey Systems	2.2%	5.1%
Software Maintenance	2.7%	6.6%
Hardware Maintenance	8.0%	9.1%
Outside Processing Services	1.8%	0.9%
Other	2.2%	1.1%
Total	100.0%	3.7%

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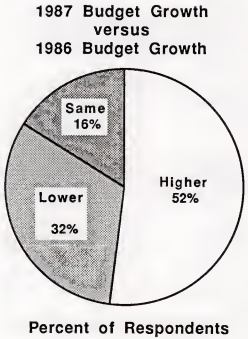
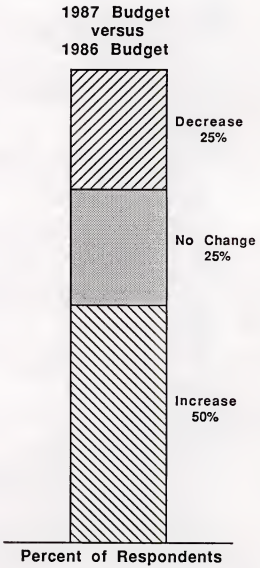
EXHIBIT IV-2

UTILITIES
BUDGETS WILL INCREASE MAINLY AT A LOWER RATE





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a result, medium and smaller utilities' IS organizations usually lag in the use of new technology and systems.

- However, the largest utilities are often selected as development partners or beta sites for new hardware.

- Furthermore, similar utilities in different geographic areas do not compete with one another. The utility industry has established organizations such as the Electric Power Research Institute (EPRI) in Palo Alto (CA) to share operations-related information. Select data processing center information is also shared.

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V NEW OPPORTUNITIES

A. ADMINISTRATIVE MARKET SECTOR

- Cost-effective applications software development is very important to users.
  - Vendors should offer the means to develop mainframe applications on personal computers, which can be tested and debugged locally, then uploaded to the corporate mainframe.
  - At $600 per hour for timesharing on a mainframe, the use of micros for program development has a tremendous payback.
- Software and professional services in support of local area networks (LANs) represents a growing area. Software must retain its functionality on the network. Professional services such as consulting with the LAN vendor may be necessary to sell more software and ensure the software actually works.
- Utility industry conferences in 1986 emphasized the "next generation" customer information system, featuring on-line data bases with information which can be updated by designated operators.
- While large utilities continue to use IBM mainframes for administrative and accounting applications, medium and small utilities have a large installed base of superminicomputers manufactured and serviced by (in descending order of installed base):

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- Digital Equipment Corporation (DEC).
- Hewlett-Packard (HP).
- Prime Computer.
- Data General Corporation (DG).

- Providing integrated software for accounting and administrative applications running on these superminis represents an opportunity for software vendors.

- Discussions with DP managers at large utility companies revealed a trend toward combined telecommunications and other information services. Vendors can help these managers devise the means to effectively combine telecommunications and IS technologies.

- Another vendor opportunity is an easy one to identify and a much harder one to implement--linking IBM mainframe computers. DP managers at large utilities using IBM mainframes want to protect their investment in hardware and, especially, in applications software. An IBM mainframe network is the solution, according to some DP managers.

- Fiber optic communications increase telecommunications capabilities in two ways:
  - The number of simultaneous voice and/or data transmissions.
  - The ability to transmit more graphics-based information.

- Developing high quality industry-oriented software is always a vendor opportunity. Vendors who start with a clean sheet of paper and talk to many utilities to learn their software requirements have an advantage over those

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vendors taking generic software and modifying it to fit the regulated utility industry. State and federal government reporting requirements for utilities are very specific; "generic" software cannot fully address these user needs.

- Partnerships between hardware vendors and other suppliers represent a "ground floor" opportunity. Examples include:

  - Turnkey systems for setting up, reading, and verifying data from hand-held meters.

  - Microcomputer-based systems using bar code readers for inventory management, paperwork management, and asset control.

  - Desktop publishing systems for newsletters and forms development and modification.

  - Automation of purchase requisitions and followup.

  - Automation of work orders and followup.

B. OPERATIONS AND MAINTENANCE MARKET SEGMENT

- Wide year-to-year variations in data processing budgets will accelerate the need for improved asset management. Utilities' major assets include buildings, vehicles, and the computer system.

- The most popular minicomputers in small and medium utilities are (in decreasing order of installed base):

  - DEC MicroVAX.

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- Hewlett-Packard 1000.

- IBM System/36 and IBM PC.

- Microcomputer-based applications software or turnkey systems for asset management are needed.

- Low-cost microcomputers enable suppliers to sell redundant monitoring and control systems at very low prices compared to redundant minicomputer-based systems.

- Small utilities typically hire consultants to design specifications for systems used in operational applications. The consultant really determines the level of hardware and software integration. Savvy vendors will keep in close contact with consultants and help plan the system to be installed or the modifications necessary.

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VI CONCLUSIONS AND RECOMMENDATIONS

- Trends toward deregulation and increased availability of other fuel sources are forcing utilities to become even more efficient.

- The most promising products and services will improve asset management and monitoring and control systems and provide turnkey solutions for such applications as desktop publishing, meter reading, and many business problems that can be effectively solved using bar code-based peripherals.

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APPENDIX UT: FORECAST RECONCILIATION

- This appendix contains the following information:
  - Exhibit UT-1 which indicates the changes made to this year's forecast as compared to last year's.
  - An explanation of significant changes that were made to the forecast.

A. PROCESSING SERVICES

- Instead of $133 million, the 1985 remote computing/batch processing market is sized at $108 million due to a shift in reclassifying some revenue from facilities management to processing services, a result of a refined definition.
- INPUT reported an 11% AAGR for 1985-1990 in our 1985 report. The AAGR from 1986 through 1991 is now forecast at 9% for the remote computing/batch processing market.
- The overall processing services 1986-1991 forecast growth rate was reduced from 11% to 10%, reflecting a more mature market segment.

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EXHIBIT UT-1

UTILITIES DATA BASE RECONCILIATION OF MARKET FORECAST, BY DELIVERY MODE

DELIVERY MODE	1985 Forecast ($ M)	1986 Report ($ M)	Variance as % of 1986 RPT	1985 Forecast ($ M)	1986 Forecast ($ M)	Variance as % of 86 FCST	85-90 AAGR Forecast in 1985 Report (Percent)	86-91 AAGR Forecast in 1986 Report (Percent)
Processing Services								
Remote Computing/Batch	$133	$108	23%	$226	$165	37%	11%	9%
Facility Management	12	20	-40%	19	33	-42%	10%	13%
Total Processing Services	$145	$128	13%	$245	$198	24%	11%	10%
Applications Software	$26	$108	-76%	$91	$219	-58%	28%	17%
Turnkey Systems	$40	$26	54%	$98	$45	118%	20%	12%

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B. APPLICATIONS SOFTWARE

- INPUT reported 1985 applications software revenues of $28 million for the utilities sector. As a result of reclassifying certain engineering and scientific cross-industry revenues, the 1986 report indicates revenues of $108 million.

- The forecast for the overall utility sector applications software market decreased from 28% to 17%. However, opportunities for software vendors exist in specific market niches.

C. TURNKEY SYSTEMS

- INPUT's 1985 report indicated turnkey systems for the utility sector was a $40 million business. Subsequent interviews with vendors selling to the utility market revealed products believed to be minicomputer-based turnkey systems were, in fact, being sold separately as applications software.

- Since many utilities have installed minicomputers, the 1986-1991 growth rate for the dollar value of turnkey systems was reduced from 20% to 12%.

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APPENDIX A: DEFINITIONS

- INFORMATION SERVICES--Computer-related services involving one or more of the following:

  - Processing of computer-based applications using vendor computers (called "processing services").

  - Services that assist users in performing functions on their own computers or vendor computers (called "software products" and/or "professional services").

  - Services that utilize a combination of hardware and software, integrated into a total system (called "turnkey systems").

A. USER EXPENDITURES

- All user expenditures reported are "available" (i.e., noncaptive, as defined below).

- NONCAPTIVE INFORMATION SERVICES USER EXPENDITURES - Expenditures paid for information services provided by a vendor that is not part of the same parent corporation as the user.

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- CAPTIVE INFORMATION SERVICES USER EXPENDITURES - Expenditures received from users who are part of the same parent corporation as the vendor.

B. DELIVERY MODES

- PROCESSING SERVICES - This category includes remote computing services, batch services, processing facilities management, and value-added networks (VANs).

  - REMOTE COMPUTING SERVICES (RCS) - Providing computer processing to a user by means of terminal(s) at the user's site(s) connected by a data communications network to the vendor's central computer. There are four submodes of RCS, including:

    - Interactive - Characterized by the interaction of the user with the system for the purpose of problem-solving, data entry, and/or transaction processing. The user is on-line to the program/files. Computer response is usually measured in seconds or fractions of a second.

    - Remote Batch - A service in which the user hands over control of a job to the vendor's computer, which schedules job execution according to priorities and resource requirements. Computer response is usually measured in minutes or hours.

    - Data Base - Characterized by the retrieval and processing of information from a vendor-provided data base. The data base may be owned by the vendor or a third party.

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- User Site Hardware Services (USHS) - Offerings provided by RCS vendors that place programmable hardware on the user's site (rather than in the vendor's computer center). USHS offers access to a communications network, access through the network to the RCS vendor's larger computers, and significant software as part of the service.

- BATCH SERVICES - This includes computer processing performed at vendors' sites of user programs and/or data that are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and computer output microfilm processing, are also included. Batch services include those expenditures by users who take their data to a vendor site that has a terminal connected to a remote computer for the actual processing.

- PROCESSING FACILITIES MANAGEMENT (PFM) (also referred to as "resource management" or "systems management") - The management of all or a major part of a user's data processing functions under a long-term contract (more than one year). This would include both remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own the facility provided to the user, either on-site, through communications lines, or in a mixed mode.

- VALUE-ADDED NETWORKS (VANs) - VANs typically involve common carrier network transmission facilities that are augmented with computerized switching. These networks have become associated with packet-switching technology because the public VANs that have received the most attention (e.g., Telenet and TYMNET) employ packet-switching techniques. However, other added data service features such as store-and-forward message switching, terminal interfacing, error detection and correction, and host computer interfacing are of equal importance.

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- Processing services are further differentiated as follows:

  - Cross-industry services involve the processing of applications that are targeted to specific user departments (e.g., finance, personnel, sales) but that cut across industry lines. Most general ledger, accounts receivable, payroll, and personnel applications fall into this category. Cross-industry data base services, for which the vendor supplies the data base and controls access to it (although it may be owned by a third party), are included in this category. General-purpose tools such as financial planning systems, linear regression packages, and other statistical routines are also included. However, when the application, tool, or data base is designed for specific industry use, then the service is industry-specific (see below).

  - Industry-specific services provide processing for particular functions or problems unique to an industry or industry group. Specialty applications can be either business or scientific in orientation. Industry-specific data base services, for which the vendor supplies the data base and controls access to it (although it may be owned by a third party), are also included under this category. Examples of industry-specialty applications are seismic data processing, numerically controlled machine tool software development, and demand deposit accounting.

  - Utility services are those for which the vendor provides access to a computer and/or communications network with basic software that enables users to develop and/or process their own systems. These basic tools often include terminal-handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

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- SOFTWARE PRODUCTS - This category includes users' purchases of applications and/or systems software that is sold by vendors as standard products intended for use by different organizations. Included as user expenditures are lease and purchase expenditures as well as fees for work performed by the vendor to implement and maintain the package (when such fees are either bundled as part of the product price or offered on an annual subscription basis). Fees for work related to education, consulting, and/or custom modification of software products are counted as professional services, provided such fees are charged separately from the price of the software product itself. There are several subcategories of software products, including:

  - APPLICATIONS SOFTWARE PRODUCTS - Software that performs a specific function directly related to solving a business or organizational need. Applications software provides information directly for use by the end user. Applications software products classifications are:

    - Cross-Industry Products - Used in multiple user industry sectors. Examples are payroll, inventory control, and financial planning.

    - Industry-Specific Products - Used in a specific industry sector such as banking and finance, transportation, or discrete manufacturing. Examples are demand deposit accounting, airline scheduling, and materials resource planning.

  - SYSTEMS SOFTWARE PRODUCTS - Software that enables the computer/communications system to perform basic functions, which are interim steps to providing the end user with "answers" sought. Systems software product classifications are:

    - Systems Control Products - These products function during applications program execution to manage the computer system

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resource. Examples include operating systems, communication monitors, and emulators.

- Data Center Management Products - These products are used by operations personnel to manage the computer system resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

- Application Development Products - These products are used to prepare applications for execution by assisting in design, programming, testing, and related functions. Examples include languages, sorts, productivity aids, data dictionaries, data base management systems, report writers, and retrieval systems.

- PROFESSIONAL SERVICES - This category is made up of modes in the following categories:

  - SOFTWARE DEVELOPMENT - This service develops a software system on a custom basis. It includes one or more of the following: user requirements, system design, contract, and programming.

  - EDUCATION AND TRAINING SERVICES - These services help people acquire new skills, techniques, or knowledge related to computers. This definition does not include services to educational institutions. (This latter market is included in the education (industry-specific) segment.)

  - CONSULTING SERVICES - Consultants advise clients on computer-related issues that are usually management oriented. Feasibility studies and computer audits are examples of services provided.

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- PROFESSIONAL SERVICES FACILITIES MANAGEMENT (PSFM) - This is counterpart to processing facilities management, except that in this case the computers are owned by the client, not the vendor; the vendor provides human resources to operate and manage the client facility.

- TURNKEY SYSTEMS (also known as Integrated Systems) - A turnkey system is an integration of systems and applications software with CPU hardware and peripherals, packaged as a single applications solution. The value added by the vendor is primarily in the software and support. Most CAD/CAM systems and many small business systems are turnkey systems. This does not include specialized hardware systems such as word processors, cash registers, or process control systems, nor does it include Embedded Computer Resources for military applications. Turnkey systems are available either as custom or packaged systems.

  - Hardware vendors that combine software with their own general purpose hardware are not classified by INPUT as turnkey vendors.

  - Turnkey systems revenue is divided into two categories.

    - Industry-specific systems--that is, systems that serve a specific function for a given industry sector such as automobile dealer parts inventory, CAD/CAM systems, or discrete manufacturing control systems.

    - Cross-industry systems--that is, systems that provide a specific function that is applicable to a wide range of industry sectors such as financial planning systems, payroll systems, or personnel management systems.

  - Revenue includes hardware, software, and support functions.

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- SYSTEMS INTEGRATION - Services associated with systems design, integration of computing components, installation, and acceptance of computer/communication systems. Systems integration can include one or more of the major information services delivery modes--professional services, turnkey systems, and software products. System components may be furnished by separate vendors (not as an integrated system by one vendor, called the prime contractor); services may be furnished by a vendor or by a not-for-profit organization. Integration services may be provided with related engineering activities, such as SE&I (Systems Engineering and Integration) or SETA (Systems Engineering and Technical Assistance).

C. HARDWARE/HARDWARE SYSTEMS

- HARDWARE - Includes all computer communications equipment that can be separatedly acquired, with or without installation by the vendor, and not acquired as part of a system.

  - PERIPHERALS - Includes all input, output, communications, and storage devices, other than main memory, that can be locally connected to the main processor and generally cannot be included in other categories, such as terminals.

  - INPUT DEVICES - Includes keyboards, numeric pads, card records, bar-code readers, lightpens and trackballs, tape readers, position and motion sensors, and A-to-D (analog-to-dialog) converters.

  - OUTPUT DEVICES - Includes printers, CRTs, projection television screens, microfilm processors, digital graphics, and plotters.

  - COMMUNICATION DEVICES - Modems, encryption equipment, special interfaces, and error control.

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- STORAGE DEVICES - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, solid state (integrated circuits), and bubble and optical memories.

- TERMINALS - There are three types of terminals:

  - USER PROGRAMMABLE (also called "intelligent terminals"):

    . Single-station or standalone.

    . Multistation-shared processor.

    . Teleprinter.

    . Remote batch.

  - USER NONPROGRAMMABLE:

    . Single-station.

    . Multistation-shared processor.

    . Teleprinter.

  - LIMITED FUNCTION - Originally developed for specific needs, such as POS (point of sale), inventory data collection, controlled access, etc.

- HARDWARE SYSTEMS - Includes all processors, from microcomputers to super (scientific) computers. Hardware systems require type- or model-unique operating software to be functional, but the category excludes applications software and peripheral devices, other than main memory and processor or CPUs not provided as part of an integrated (turnkey) system.

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- MICROCOMPUTER (or personal computer or PC) - Combines all of the CPU, memory, and peripheral functions of an 8- or 16-bit computer on a chip, in the form of:

  - Integrated circuit package.
  - Plug-in board with more memory and peripheral circuits.
  - Console--including keyboard and interfacing connectors.
  - Personal computer with at least one external storage device directly addressable by CPU.

- MINICOMPUTER - Usually a 12-, 16- or 32-bit computer, which may be provided with limited applications software and support, and may represent a portion of a complete large system.

  - Personal business computer.
  - Small laboratory computer.
  - Nodal computer in a distributed data network, remote data collection network, connected to remote microcomputers.

- MAINFRAME - Typically a 32- or 64-bit computer, with extensive applications software and a number of peripherals in standalone or multiple CPU configurations for business (administrative, personnel, and logistics) applications, also called a General-Purpose Computer.

  - Large computer mainframes are presently centered around storage controllers but likely to become bus-oriented and to consist of multiple processors (CPUs) or parallel processors;

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they are intended for structured mathematical and signal processing, and are generally used with general-purpose von-Newmann-type processors for system control.

- Supercomputer mainframes are high-powered processors with numerical processing throughout that is significantly greater than the largest general-purpose computers, with capacities in the 10-50 MFLOPS (million floating point operations per second) range, in two categories:

- REAL TIME - Generally used for signal processing.

- NONREAL TIME - For scientific use, with maximum burst-mode (but sustained speed) capacities of up to 100 MFLOPS, in one of three configurations:

  - Parallel processors.

  - Pipeline processors.

  - Vector processors.

- Newer supercomputers--with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-three gigabyte class--are also becoming more common.

- EMBEDDED COMPUTER - Dedicated computer system designed and implemented as an integral part of a weapon or weapon system, or platform, that is critical to a military or intelligence mission, such as command and control, cryptological activities, or intelligence activities. Characterized by MIL SPEC (military specification) appearance and operation, limited but reprogrammable applications software, and permanent or semipermanent interfaces. May vary in capacity from

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microcomputers to parallel-processor computer systems. Information services forecasts in this report do not include applications for this type of computer.

D. TELECOMMUNICATIONS

- NETWORKS - Interconnection services between computing resources. Provided on a leased basis by a vendor to move data and/or textual information from one or more locations to one or more locations.

  - COMMON CARRIER NETWORK (CCN) - Provided via conventional voice-grade circuits and through regular switching facilities (dial-up calling) with leased or user-owned modems (to convert digital information to voice-grade tones) for transfer rates between 150 and 1,200 baud.

  - VALUE-ADDED NETWORK (VAN) - (See listing under Section B, Delivery Modes.)

  - LOCAL-AREA NETWORK (LAN) - Restricted limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a metropolitan area. One of the two types:

    - BASEBAND - Voice bandwidth at voice frequencies (same as telephone, teletype system) limited to a single sender at any given moment and limited to speeds of 75 to 1,200 baud, in serial mode.

    - BROADBAND - Employs multiplexing techniques to increase carrier frequency between terminals, to provide:

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- Multiple (simultaneous) channels via FDM (Frequency Division Multiplexing).

- Multiple (time-sequenced) channels via TDM (Time Division Multiplexing).

- High-speed data transfer rate via parallel mode at rates of up to 96,000 baud (or higher, depending on media).

- TRANSMISSION MEDIA - Varies with the supplier (vendor) and with the distribution of the network and its access mode to the individual computing resource location.

  - MODE - may be either:

    - ANALOG - Typified by the predominantly voice-grade network of AT&T's DDD (Direct Distance Dialing) and by operating telephone company distribution systems.

    - DIGITAL - Where voice, data, and/or text are digitized into a binary stream.

  - MEDIA varies with distance, availability, and connectivity:

    - WIRE - Varies from earlier single-line teletype networks, to two-wire standard telephone (twisted pair) and balanced line, to four-wire full-duplex balanced lines.

    - CARRIER - Multiplexed signals on two-wire and four-wire networks to increase capacity by FDM.

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- COAXIAL CABLE - HF (High Frequency) and VHF (Very High Frequency), single frequency, or carrier-based system that requires frequent reamplification (repeaters) to carry the signal any distance.

- MICROWAVE - UHF (Ultra High Frequency) multichannel, point-to-point, repeated radio transmission, also capable of wide frequency channels.

- OPTICAL FIBER - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers, and using TDM for multichannel applications.

- SATELLITES - Synchronous earth-orbiting systems that provide point-to-point, two-way service over significant distances without intermediate amplification (repeaters), but requiring suitable groundstation facilities for up- and down-link operation.

- CELLULAR RADIO - Network of fixed, low-powered two-way radios that are linked by a computer system to track mobile phone/data set units; each radio serves a small area called a cell. The computer switches service connection to the mobile unit from cell to cell as the unit moves among the cells.

E. OTHER CONSIDERATIONS

- When questions arise about the proper place to count certain user expenditures, INPUT addresses them from the user viewpoint. Expenditures are then categorized according to what users perceive they are buying.

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- The standard industrial classification (SIC) codes are used to define the economic activity contained in generic sectors such as process manufacturing, insurance, or transportation.

- The specific industries (and their SIC codes) included under these generic industry sectors are detailed in the exhibit.

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EXHIBIT

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Discrete Manufacturing	23	Apparel
	25	Furniture
	27	Printing
	31	Leather
	34	Metal
	35	Machinery
	36	Electronics
	37	Transportation
	38	Scientific and Control Instruments
	39	Miscellaneous Manufacturing
Process Manufacturing	10	Metal Mining
	11	Anthracite Mining
	12	Coal Mining
	13	Oil and Gas Extraction
	14	Mining/Quarrying of Non-Metallic Minerals, except Fuels
	20	Food Products
	21	Tobacco
	22	Textile Products
	24	Lumber and Wood Products
	26	Paper Products
	28	Chemicals
	29	Petroleum
	30	Rubber and Plastics
	32	Stone, Glass, Clay
	33	Primary Metals

Continued

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EXHIBIT (Cont.)

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Transportation	40	Railroads
	41	Local Transit
	42	Motor Freight
	43	U.S. Postal Service
	44	Water Transportation
	45	Air
	46	Pipelines
	47	Transportation Services
Utilities	49	Electric, Gas, and Sanitary
Telecommunications	48	Communications
Wholesale Distribution	50	Durable Goods
	51	Nondurable Goods
Retail Distribution	52	Building Materials, Hardware
	53	General Merchandise
	54	Food
	55	Automotive and Gas Stations
	56	Apparel
	57	Furniture
	58	Eating and Drinking
	59	Miscellaneous Retail

Continued

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EXHIBIT (Cont.)

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Banking and Finance	60	Banks
	61	Credit Agencies
	62	Security and Commodity Brokers
	67	Holding and Investment Offices
Insurance	63	Insurance (Life, Health, Etc.)
	64	Insurance Agents
Medical	80	Health Services
Education	82	Educational Services
Services	73	Business Services (excluding information services companies themselves)
	89	Miscellaneous Services
Federal Government	N/A	As Appropriate
State and Local Government	N/A	As Appropriate

Continued

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EXHIBIT (Cont.)

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Other Industries	01-09	Agriculture, Forestry, and Fishing
	15-17	Construction
	65	Real Estate
	66	Combinations of Real Estate, Insurance, Loans, Law Offices
	70	Hotels, Rooming Houses, Camps, and Other Lodging Places
	72	Personal Services
	75	Automotive Repair, Services, and Garages
	76	Miscellaneous Repair Services
	78	Motion Pictures
	79	Amusement and Recreation Services, Except Motion Pictures
	81	Legal Services
	83	Social Services
	84	Museums, Art Galleries, Botanical and Zoological Gardens
	86	Membership Organizations

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APPENDIX B: FORECAST DATA BASE

- Exhibits V-B-1 through V-B-45 provide the industry forecasts for 1986. In addition to the forecasts by delivery mode, there are detailed forecasts by industry-specific and cross-industry market segmentations.

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EXHIBIT V-B-1

INFORMATION SERVICES MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	2767	21%	3361	4095	5062	6154	7239	8987	22%
PROCESS MANUFACTURING	1148	12%	1283	1441	1617	1820	2041	2278	12%
TRANSPORTATION	468	16%	544	634	735	897	1071	1266	18%
UTILITIES	262	10%	289	319	356	399	462	537	13%
TELECOMMUNICATIONS	605	19%	717	871	1065	1291	1570	1929	22%
DISTRIBUTION	1564	20%	1881	2277	2774	3334	3931	4500	19%
BANKING AND FINANCE	4688	18%	5518	6372	7420	8661	10265	11895	17%
INSURANCE	1104	14%	1255	1446	1682	1945	2266	2595	16%
MEDICAL	1740	22%	2129	2603	3202	3959	4931	5893	23%
EDUCATION	278	14%	316	361	411	470	529	592	13%
SERVICES	1305	15%	1506	1732	2046	2303	2650	3043	15%
FEDERAL GOVERNMENT	581	21%	701	794	932	1071	1237	1440	15%
STATE AND LOCAL GOVERNMENT	544	17%	637	750	891	1060	1260	1430	18%
OTHER INDUSTRY-SPECIFIC	669	16%	774	896	1033	1196	1377	1593	16%
SUB-TOTAL	17723	18%	20911	24591	29226	34560	40829	47978	18%
CROSS-INDUSTRY									
PLANNING AND ANALYSIS	1781	10%	1954	2143	2364	2579	2869	3171	10%
ACCOUNTING	2432	7%	2609	2804	3022	3262	3507	3761	8%
HUMAN RESOURCES	1523	14%	1731	1964	2211	2461	2715	2974	11%
ENGINEERING/SCIENTIFIC	712	14%	813	932	1073	1243	1445	1690	16%
EDUCATION/TRAINING	270	16%	313	364	414	470	537	614	14%
ON-LINE DATA BASES	722	23%	886	1112	1377	1675	2153	2620	24%
OTHER CROSS-INDUSTRY	2379	11%	2641	2939	3265	3752	4264	4986	14%
SUB-TOTAL	9819	11%	10947	12258	13726	15442	17490	19816	13%
OTHER									
PROFESSIONAL SERVICES	10571	19%	12542	14698	17313	20542	24181	28735	18%
UTILITY PROCESSING	2222	8%	2402	2588	2809	3002	3243	3501	8%
SYSTEMS SOFTWARE	6085	23%	7501	9128	11064	13449	16826	21962	24%
VANS	308	33%	409	532	686	885	1115	1393	28%
GRAND TOTAL	46728	17%	54712	63795	74824	87880	103684	123385	18%

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INFORMATION SERVICES MARKET
BY DELIVERY MODE, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH									
INDUSTRY SPECIFIC	7456	16%	8614	9848	11320	13040	14984	17134	15%
CROSS INDUSTRY	3845	9%	4172	4580	5051	5592	6326	7069	11%
UTILITY PROCESSING	2066	8%	2221	2377	2567	2721	2911	3109	7%
SUBTOTAL	13367	12%	15007	16805	18938	21353	24221	27312	13%
FACILITIES MANAGEMENT									
INDUSTRY SPECIFIC	2215	14%	2523	2854	3281	3741	4294	4860	14%
CROSS INDUSTRY	60	3%	62	63	64	76	71	76	4%
UTILITY PROCESSING	156	16%	181	211	242	281	332	392	17%
SUBTOTAL	2431	14%	2766	3128	3587	4098	4697	5328	14%
TOTAL PROCESSING/NETWORK SERV.									
INDUSTRY SPECIFIC	9671	15%	11137	12702	14601	16781	19278	21994	15%
CROSS INDUSTRY	3905	8%	4234	4643	5115	5668	6397	7145	11%
UTILITY PROCESSING	2222	8%	2402	2588	2809	3002	3243	3501	8%
VANS	308	33%	409	532	686	885	1115	1393	28%
TOTAL	16106	13%	18182	20465	23211	26336	30033	34033	13%
SOFTWARE PRODUCTS									
MAINFRAME/MINICOMPUTER									
INDUSTRY SPECIFIC	2710	23%	3340	4108	5063	6323	7775	9331	23%
CROSS INDUSTRY	2221	13%	2517	2828	3189	3576	4021	4520	12%
SUBTOTAL	4931	21%	5857	6936	8252	9899	11796	13851	20%
MICROCOMPUTER									
INDUSTRY SPECIFIC	532	36%	721	1008	1396	1845	2463	3232	35%
CROSS INDUSTRY	1461	18%	1720	2041	2392	2825	3359	4042	19%
SUBTOTAL	1993	25%	2441	3049	3788	4670	5822	7274	28%
TOTAL APPLICATIONS SOFTWARE	6924	20%	8298	9985	12040	14569	17618	21125	21%
SYSTEMS SOFTWARE									
MAINFRAME/MINICOMPUTER	5350	22%	6540	7776	9192	10912	13501	17420	22%
MICROCOMPUTER	735	31%	961	1352	1872	2537	3325	4542	36%
TOTAL SYSTEMS SOFTWARE	6085	23%	7501	9128	11064	13449	16826	21962	24%
TOTAL SOFTWARE	13009	21%	15799	19113	23104	28018	34444	43087	22%
PROFESSIONAL SERVICES									
SOFTWARE DEVELOPMENT	5814	16%	6729	7768	8980	10285	11888	13751	15%
CONSULTING	1725	20%	2064	2470	2975	3610	4350	5245	21%
EDUCATION	1104	20%	1322	1590	1920	2325	2805	3380	21%
SYSTEMS INTEGRATION	1198	26%	1512	1879	2368	3159	3882	4979	27%
FACILITIES MANAGEMENT	730	25%	915	991	1070	1163	1256	1380	9%
TOTAL PROFESSIONAL SERVICES	10571	19%	12542	14698	17313	20542	24181	28735	18%
TURNKEY SYSTEMS									
INDUSTRY SPECIFIC	4810	19%	5713	6773	8166	9611	11313	13421	19%
CROSS INDUSTRY	2232	11%	2476	2746	3030	3373	3713	4109	11%
TOTAL TURNKEY SYSTEMS	7042	16%	8189	9519	11196	12984	15026	17530	16%
GRAND TOTAL	46728	17%	54712	63795	74824	87880	103684	123385	18%

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PROCESSING SERVICES MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 85-90
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	569	18%	672	799	956	1141	1310	1577	19%
PROCESS MANUFACTURING	697	14%	793	902	1027	1166	1324	1504	14%
TRANSPORTATION	216	9%	236	258	294	340	398	461	14%
UTILITIES	128	8%	138	149	162	178	198	219	10%
TELECOMMUNICATIONS	357	16%	414	496	590	689	809	960	18%
DISTRIBUTION	821	14%	934	1069	1243	1458	1660	1840	15%
BANKING AND FINANCE	3198	17%	3737	4255	4885	5615	6515	7445	15%
INSURANCE	629	11%	696	777	879	987	1122	1245	12%
MEDICAL	928	17%	1087	1265	1464	1705	1993	2332	16%
EDUCATION	120	10%	132	145	160	176	193	213	10%
SERVICES	857	14%	976	1102	1245	1406	1588	1793	13%
FEDERAL GOVERNMENT	243	17%	285	298	336	359	385	432	9%
STATE AND LOCAL GOVERNMENT	406	17%	475	559	663	787	932	1038	17%
OTHER INDUSTRY-SPECIFIC	502	12%	562	628	697	774	851	935	11%
SUB-TOTAL	9671	15%	11137	12702	14601	16781	19278	21994	15%
CROSS-INDUSTRY									
PLANNING AND ANALYSIS	250	0%	250	246	241	237	231	225	-2%
ACCOUNTING	1030	2%	1051	1072	1093	1115	1137	1160	2%
HUMAN RESOURCES	893	11%	992	1111	1252	1420	1598	1789	13%
ENGINEERING/SCIENTIFIC	250	5%	263	276	289	304	319	335	5%
EDUCATION/TRAINING	80	11%	89	98	106	115	123	130	8%
ON-LINE DATA BASES	722	23%	886	1112	1377	1675	2153	2620	24%
OTHER CROSS-INDUSTRY	680	3%	703	728	757	802	836	886	5%
SUB-TOTAL	3905	8%	4234	4643	5115	5668	6397	7145	11%
OTHER									
UTILITY PROCESSING	2222	8%	2402	2588	2809	3002	3243	3501	8%
VALUE ADDED NETWORKS	308	33%	409	532	686	885	1115	1393	28%
GRAND TOTAL	16106	13%	18182	20465	23211	26336	30033	34033	13%

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NETWORK/REMOTE COMPUTING/BATCH SERVICES MARKET BY MARKET SECTOR, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC SECTORS									
DISCRETE MANUFACTURING	525	18%	621	740	887	1062	1218	1470	19%
PROCESS MANUFACTURING	657	14%	749	854	974	1110	1265	1442	14%
TRANSPORTATION	190	10%	209	230	264	309	365	427	15%
UTILITIES	108	8%	117	126	137	150	165	181	9%
TELECOMMUNICATIONS	340	16%	394	473	558	652	766	910	18%
DISTRIBUTION	773	14%	883	1015	1185	1396	1592	1767	15%
BANKING AND FINANCE	2350	17%	2757	3135	3605	4145	4810	5470	15%
INSURANCE	304	12%	339	383	430	485	564	626	13%
MEDICAL	601	18%	708	822	945	1103	1295	1516	16%
EDUCATION	101	11%	112	124	138	153	169	188	11%
SERVICES	850	14%	969	1095	1237	1398	1580	1785	13%
FEDERAL GOVERNMENT	54	33%	72	75	84	87	84	102	7%
STATE AND LOCAL GOVERNMENT	110	20%	132	158	190	228	273	328	20%
OTHER INDUSTRY-SPECIFIC	493	12%	552	618	686	762	838	922	11%
SUB-TOTAL	7456	16%	8614	9848	11320	13040	14984	17134	15%
CROSS-INDUSTRY SECTORS									
PLANNING AND ANALYSIS	250	0%	250	246	241	237	231	225	-2%
ACCOUNTING	1030	2%	1051	1072	1093	1115	1137	1160	2%
HUMAN RESOURCES	893	11%	992	1111	1252	1420	1598	1789	13%
ENGINEERING/SCIENTIFIC	250	5%	263	276	289	304	319	335	5%
EDUCATION/TRAINING	80	11%	89	98	106	115	123	130	8%
ON-LINE DATA BASES	722	23%	886	1112	1377	1675	2153	2620	24%
OTHER CROSS-INDUSTRY	620	3%	641	665	693	726	765	810	5%
SUB-TOTAL	3845	9%	4172	4580	5051	5592	6326	7069	11%
OTHER SECTORS									
UTILITY PROCESSING	2066	8%	2221	2377	2567	2721	2911	3109	7%
VALUE ADDED NETWORKS	308	33%	409	532	686	885	1115	1393	28%
GRAND TOTAL	13675	13%	15416	17337	19624	22238	25336	28705	13%

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PROCESSING FACILITIES MANAGEMENT MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	44	16%	51	59	69	79	92	107	16%
PROCESS MANUFACTURING	40	10%	44	48	53	56	59	62	7%
TRANSPORTATION	26	4%	27	28	30	31	33	34	5%
UTILITIES	20	5%	21	23	25	28	33	38	13%
TELECOMMUNICATIONS	17	18%	20	23	32	37	43	50	20%
DISTRIBUTION	48	6%	51	54	58	62	68	73	7%
BANKING AND FINANCE	848	16%	980	1120	1280	1470	1705	1975	15%
INSURANCE	325	10%	357	394	449	502	558	619	12%
MEDICAL	327	16%	379	443	519	602	698	816	17%
EDUCATION	19	5%	20	21	22	23	24	25	5%
SERVICES	7	0%	7	7	8	8	8	8	3%
FEDERAL GOVERNMENT	189	13%	213	223	252	272	301	330	9%
STATE AND LOCAL GOVERNMENT	296	16%	343	401	473	559	659	710	16%
OTHER INDUSTRY-SPECIFIC	9	11%	10	10	11	12	13	13	5%
SUB-TOTAL	2215	14%	2523	2854	3281	3741	4294	4860	14%
CROSS INDUSTRY TOTAL	60	3%	62	63	64	76	71	76	4%
UTILITY PROCESSING SECTOR	156	16%	181	211	242	281	332	392	17%
GRAND TOTAL	2431	14%	2766	3128	3587	4098	4697	5328	14%

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ON-LINE DATA BASE SERVICES MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	126	18%	149	178	213	266	305	368	20%
PROCESS MANUFACTURING	176	14%	200	231	283	315	382	408	15%
TRANSPORTATION	61	10%	67	74	87	102	120	141	16%
UTILITIES	25	12%	28	32	34	39	45	49	12%
TELECOMMUNICATIONS	61	23%	75	95	123	143	184	228	25%
DISTRIBUTION	178	32%	235	296	370	459	564	671	23%
BANKING AND FINANCE	701	25%	876	1010	1241	1428	1727	1979	18%
INSURANCE	82	12%	92	103	116	136	158	175	14%
MEDICAL	114	31%	149	189	217	276	324	409	22%
EDUCATION	48	17%	56	62	70	78	88	100	12%
SERVICES	262	14%	299	337	398	449	512	605	15%
FEDERAL GOVERNMENT	5	60%	8	10	13	14	15	19	19%
STATE AND LOCAL GOVERNMENT	6	50%	9	12	15	18	20	23	21%
OTHER INDUSTRY-SPECIFIC	49	33%	65	81	102	126	155	166	21%
SUB-TOTAL	1894	22%	2308	2710	3282	3849	4599	5341	18%
CROSS INDUSTRY									
SECURITIES	154	27%	195	252	322	409	558	679	28%
CREDIT	237	23%	291	342	389	440	512	576	15%
TEXT/BIBLIOGRAPHY	82	20%	98	117	143	173	210	254	21%
NEWS	154	24%	191	259	334	412	575	759	32%
ECONOMIC/OTHER	95	17%	111	142	189	241	298	352	26%
SUB-TOTAL	722	23%	886	1112	1377	1675	2153	2620	24%
GRAND TOTAL	2616	22%	3194	3822	4659	5524	6752	7961	20%

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SOFTWARE PRODUCTS MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
APPLICATIONS SOFTWARE									
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	717	25%	897	1141	1451	1822	2120	2686	25%
PROCESS MANUFACTURING	124	5%	130	139	149	162	176	194	8%
TRANSPORTATION	132	23%	163	205	235	309	373	447	22%
UTILITIES	108	13%	122	138	158	181	219	267	17%
TELECOMMUNICATIONS	49	39%	68	96	137	191	264	363	40%
DISTRIBUTION	292	31%	383	505	666	867	1125	1366	29%
BANKING AND FINANCE	860	23%	1061	1302	1605	1976	2505	3010	23%
INSURANCE	311	18%	366	439	522	616	733	870	19%
MEDICAL	296	48%	438	625	897	1262	1757	2167	38%
EDUCATION	68	19%	81	97	114	134	155	178	17%
SERVICES	110	23%	135	165	202	247	302	370	22%
FEDERAL GOVERNMENT	62	19%	74	82	92	106	132	162	17%
STATE AND LOCAL GOVERNMENT	45	16%	52	61	72	85	101	120	18%
OTHER INDUSTRY-SPECIFIC	68	34%	91	121	159	210	276	363	32%
SUB-TOTAL	3242	25%	4061	5116	6459	8168	10238	12563	25%
CROSS-INDUSTRY									
PLANNING AND ANALYSIS	1289	12%	1438	1600	1777	1968	2237	2521	12%
ACCOUNTING	1044	11%	1164	1299	1453	1628	1809	2001	11%
HUMAN RESOURCES	440	19%	522	608	685	737	782	820	9%
ENGINEERING/SCIENTIFIC	182	25%	228	286	358	449	563	707	25%
EDUCATION/TRAINING	70	24%	87	110	132	158	193	236	22%
OTHER CROSS-INDUSTRY	657	21%	798	966	1176	1461	1796	2277	23%
SUB-TOTAL	3682	15%	4237	4869	5581	6401	7380	8562	15%
TOTAL APPLICATIONS SOFTWARE	6924	20%	8298	9985	12040	14569	17618	21125	21%
SYSTEMS SOFTWARE									
APPLICATION DEVELOPMENT	2490	16%	2882	3290	3990	4883	6060	7410	21%
SYSTEMS CONTROL	2325	29%	3008	3755	4483	5286	6501	9412	26%
DATA CENTER MANAGEMENT	1270	27%	1611	2083	2591	3280	4265	5140	26%
TOTAL SYSTEMS SOFTWARE	6085	23%	7501	9128	11064	13449	16826	21962	24%
GRAND TOTAL	13009	21%	15799	19113	23104	28018	34444	43087	22%

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EXHIBIT V-B-10

SYSTEMS SOFTWARE PRODUCTS MARKET
BY DELIVERY MODE, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
APPLICATION DEVELOPMENT TOOLS									
MAINFRAME/MINI	2100	12%	2352	2530	2985	3582	4370	5200	17%
MICRO	390	36%	530	760	1005	1301	1690	2210	33%
TOTAL APPLICATION DEV. TOOLS	2490	16%	2882	3290	3990	4883	6060	7410	21%
SYSTEMS CONTROL									
MAINFRAME/MINI	2000	30%	2600	3206	3688	4185	5106	7520	24%
MICRO	325	26%	408	549	795	1101	1395	1892	36%
TOTAL SYSTEMS CONTROL	2325	29%	3008	3755	4483	5286	6501	9412	26%
DATA CENTER MANAGEMENT									
MAINFRAME/MINI	1250	27%	1588	2040	2519	3145	4025	4700	24%
MICRO	20	15%	23	43	72	135	240	440	80%
TOTAL DATA CENTER MANAGEMENT	1270	27%	1611	2083	2591	3280	4265	5140	26%
TOTAL MAINFRAME/MINI	5350	22%	6540	7776	9192	10912	13501	17420	22%
TOTAL MICROCOMPUTER	735	31%	961	1352	1872	2537	3325	4542	36%
GRAND TOTAL	6085	23%	7501	9128	11064	13449	16826	21962	24%

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TURNKEY SYSTEMS MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	1481	21%	1792	2155	2655	3191	3809	4724	21%
PROCESS MANUFACTURING	327	10%	360	400	441	492	541	580	10%
TRANSPORTATION	120	21%	145	171	206	248	300	358	20%
UTILITIES	26	12%	29	32	36	40	45	51	12%
TELECOMMUNICATIONS	199	18%	235	279	338	411	497	606	21%
DISTRIBUTION	451	25%	564	703	865	1009	1146	1294	18%
BANKING AND FINANCE	630	14%	720	815	930	1070	1245	1440	15%
INSURANCE	164	18%	193	230	281	342	411	480	20%
MEDICAL	516	17%	604	713	841	992	1181	1394	18%
EDUCATION	90	14%	103	119	137	160	181	201	14%
SERVICES	338	17%	395	465	599	650	760	880	17%
FEDERAL GOVERNMENT	276	24%	342	414	504	606	720	846	20%
STATE AND LOCAL GOVERNMENT	93	18%	110	130	156	188	227	272	20%
OTHER INDUSTRY-SPECIFIC	99	22%	121	147	177	212	250	295	20%
SUB-TOTAL	4810	19%	5713	6773	8166	9611	11313	13421	19%
CROSS INDUSTRY									
PLANNING AND ANALYSIS	242	10%	266	297	346	374	401	425	10%
ACCOUNTING	358	10%	394	433	476	519	561	600	9%
HUMAN RESOURCES	190	14%	217	245	274	304	335	365	11%
ENGINEERING/SCIENTIFIC	280	15%	322	370	426	490	563	648	15%
EDUCATION/TRAINING	120	14%	137	156	176	197	221	248	13%
OTHER CROSS-INDUSTRY	1042	9%	1140	1245	1332	1489	1632	1823	10%
SUB-TOTAL	2232	11%	2476	2746	3030	3373	3713	4109	11%
GRAND TOTAL	7042	16%	8189	9519	11196	12984	15026	17530	16%

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MINI/MAINFRAME SOFTWARE PRODUCTS MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	661	22%	806	984	1210	1491	1644	1972	20%
PROCESS MANUFACTURING	96	4%	100	107	114	123	133	145	8%
TRANSPORTATION	110	20%	132	158	170	228	274	328	20%
UTILITIES	75	11%	83	91	100	110	129	152	13%
TELECOMMUNICATIONS	42	36%	57	81	113	156	213	287	38%
DISTRIBUTION	215	29%	277	357	461	595	767	902	27%
BANKING AND FINANCE	770	22%	940	1135	1375	1677	2115	2540	22%
INSURANCE	230	15%	265	304	346	391	451	525	15%
MEDICAL	252	45%	366	512	717	997	1365	1638	35%
EDUCATION	25	12%	28	32	36	41	46	52	13%
SERVICES	86	22%	105	127	154	186	225	272	21%
FEDERAL GOVERNMENT	50	18%	59	66	74	85	106	130	17%
STATE AND LOCAL GOVERNMENT	35	11%	39	45	52	60	70	82	16%
OTHER INDUSTRY-SPECIFIC	63	32%	83	109	141	183	237	306	30%
SUB-TOTAL	2710	23%	3340	4108	5063	6323	7775	9331	23%
CROSS-INDUSTRY									
PLANNING AND ANALYSIS	603	10%	663	710	785	864	961	1076	10%
ACCOUNTING	810	9%	883	962	1049	1143	1246	1359	9%
HUMAN RESOURCES	410	18%	485	563	630	670	700	720	8%
ENGINEERING/SCIENTIFIC	150	24%	186	231	286	355	440	545	24%
EDUCATION/TRAINING	30	23%	37	46	55	65	76	88	19%
OTHER CROSS-INDUSTRY	218	21%	263	316	384	479	598	732	23%
SUB-TOTAL	2221	13%	2517	2828	3189	3576	4021	4520	12%
TOTAL APPLICATIONS SOFTWARE	4931	19%	5857	6936	8252	9899	11796	13851	19%
SYSTEMS SOFTWARE									
APPLICATION DEV TOOLS	2100	12%	2352	2530	2985	3582	4370	5200	17%
SYSTEMS CONTROL	2000	30%	2600	3206	3688	4185	5106	7520	24%
DATA CENTER MANAGEMENT	1250	27%	1588	2040	2519	3145	4025	4700	24%
SUB-TOTAL	5350	22%	6540	7776	9192	10912	13501	17420	22%
GRAND TOTAL	10281	21%	12397	14712	17444	20811	25297	31271	20%

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MICROCOMPUTER SOFTWARE PRODUCTS MARKET
BY MARKET SEGMENT, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	56	63%	91	157	241	331	476	714	51%
PROCESS MANUFACTURING	28	7%	30	32	35	39	43	49	10%
TRANSPORTATION	22	41%	31	47	65	81	99	119	31%
UTILITIES	33	18%	39	47	58	71	90	115	24%
TELECOMMUNICATIONS	7	57%	11	15	24	35	51	76	47%
DISTRIBUTION	77	38%	106	148	205	272	358	464	34%
BANKING AND FINANCE	90	34%	121	167	230	299	390	470	31%
INSURANCE	81	25%	101	135	176	225	282	345	28%
MEDICAL	44	64%	72	113	180	265	392	529	49%
EDUCATION	43	23%	53	65	78	93	109	126	19%
SERVICES	24	25%	30	38	48	61	77	98	27%
FEDERAL GOVERNMENT	12	25%	15	16	18	21	26	32	16%
STATE AND LOCAL GOVERNMENT	10	30%	13	16	20	25	31	38	24%
OTHER INDUSTRY-SPECIFIC	5	60%	8	12	18	27	39	57	48%
SUB-TOTAL	532	36%	721	1008	1396	1845	2463	3232	35%
CROSS-INDUSTRY									
PLANNING AND ANALYSIS	686	13%	775	890	992	1104	1276	1445	13%
ACCOUNTING	234	20%	281	337	404	485	563	642	18%
HUMAN RESOURCES	30	23%	37	45	55	67	82	100	22%
ENGINEERING/SCIENTIFIC	32	31%	42	55	72	94	123	162	31%
EDUCATION/TRAINING	40	25%	50	64	77	93	117	148	24%
OTHER CROSS-INDUSTRY	439	22%	535	650	792	982	1198	1545	24%
SUB-TOTAL	1461	18%	1720	2041	2392	2825	3359	4042	19%
TOTAL APPLICATIONS SOFTWARE	1993	22%	2441	3049	3788	4670	5822	7274	24%
SYSTEMS SOFTWARE									
APPLICATION DEV TOOLS	390	36%	530	760	1005	1301	1690	2210	33%
SYSTEMS CONTROL	325	26%	408	549	795	1101	1395	1892	36%
DATA CENTER MANAGEMENT	20	15%	23	43	72	135	240	440	80%
SUB-TOTAL	735	31%	961	1352	1872	2537	3325	4542	36%
GRAND TOTAL	2728	25%	3402	4401	5660	7207	9147	11816	28%

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EXHIBIT V-B-12

PROFESSIONAL SERVICES MARKET BY INDUSTRY, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
INDUSTRY-SPECIFIC									
DISCRETE MANUFACTURING	1695	23%	2089	2712	3327	4071	4764	5688	22%
PROCESS MANUFACTURING	932	19%	1109	1259	1427	1836	2432	3055	22%
TRANSPORTATION	137	15%	157	184	215	256	305	407	21%
UTILITIES	67	10%	74	83	90	96	103	112	9%
TELECOMMUNICATIONS	392	25%	489	611	764	955	1193	1392	23%
DISTRIBUTION	536	17%	625	735	945	1140	1290	1460	18%
BANKING AND FINANCE	1250	19%	1490	1773	2110	2511	2988	3456	18%
INSURANCE	811	16%	940	1082	1244	1431	1645	1950	16%
MEDICAL	220	21%	266	324	399	494	598	724	22%
EDUCATION	65	8%	70	77	84	92	101	110	9%
SERVICES	140	16%	163	189	219	258	302	397	19%
FEDERAL GOVERNMENT	2764	17%	3230	3574	3989	4414	4917	5536	11%
STATE AND LOCAL GOVERNMENT	1342	17%	1575	1764	2099	2498	2973	3775	19%
OTHER INDUSTRY-SPECIFIC	220	20%	265	331	401	490	570	673	20%
GRAND TOTAL	10571	19%	12542	14698	17313	20542	24181	28735	18%

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PROFESSIONAL SERVICES MARKET
BY TYPE OF SERVICE, 1986-1991

SEGMENTATION	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
FEDERAL GOVERNMENT PROFESSIONAL SERVICES									
SOFTWARE DEVELOPMENT	850	13%	961	1078	1220	1285	1443	1652	11%
CONSULTING	305	16%	355	370	390	430	450	480	6%
EDUCATION & TRAINING	250	8%	270	300	330	370	400	410	9%
SYSTEMS INTEGRATION	789	15%	904	1026	1189	1399	1634	1924	16%
FACILITIES MANAGEMENT	570	30%	740	800	860	930	990	1070	8%
SUB-TOTAL	2764	17%	3230	3574	3989	4414	4917	5536	11%
COMMERCIAL PROFESSIONAL SERVICES									
SOFTWARE DEVELOPMENT	4964	16%	5768	6690	7760	9000	10445	12099	16%
CONSULTING	1420	20%	1709	2100	2585	3180	3900	4765	23%
EDUCATION & TRAINING	854	23%	1052	1290	1590	1955	2405	2970	23%
SYSTEMS INTEGRATION	409	49%	608	853	1179	1760	2248	3055	38%
FACILITIES MANAGEMENT	160	9%	175	191	210	233	266	310	12%
SUB-TOTAL	7807	19%	9312	11124	13324	16128	19264	23199	20%
GRAND TOTAL PROFESSIONAL SERVICES									
SOFTWARE DEVELOPMENT	5814	16%	6729	7768	8980	10285	11888	13751	15%
CONSULTING	1725	20%	2064	2470	2975	3610	4350	5245	21%
EDUCATION & TRAINING	1104	20%	1322	1590	1920	2325	2805	3380	21%
SYSTEMS INTEGRATION	1198	26%	1512	1879	2368	3159	3882	4979	27%
FACILITIES MANAGEMENT	730	25%	915	991	1070	1163	1256	1380	9%
GRAND TOTAL	10571	19%	12542	14698	17313	20542	24181	28735	18%

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EXHIBIT V-B-14

DISCRETE MANUFACTURING INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	525	18%	621	740	887	1062	1218	1470	19%
FACILITY MANAGEMENT	44	16%	51	59	69	79	92	107	16%
TOTAL PROCESSING SERVICES	569	18%	672	799	956	1141	1310	1577	19%
APPLICATION SOFTWARE									
MAINFRAME/MINI	661	22%	806	984	1210	1491	1644	1972	20%
MICRO	56	63%	91	157	241	331	476	714	51%
TOTAL APPLICATION SOFTWARE	717	25%	897	1141	1451	1822	2120	2686	25%
TURNKEY SYSTEMS	1481	21%	1792	2155	2655	3191	3809	4724	21%
SECTOR TOTAL	2767	21%	3361	4095	5062	6154	7239	8987	22%

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EXHIBIT V-B-15

PROCESS MANUFACTURING INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	657	14%	749	854	974	1110	1265	1442	14%
FACILITY MANAGEMENT	40	10%	44	48	53	56	59	62	7%
TOTAL PROCESSING SERVICES	697	14%	793	902	1027	1166	1324	1504	14%
APPLICATION SOFTWARE									
MAINFRAME/MINI	96	4%	100	107	114	123	133	145	8%
MICRO	28	7%	30	32	35	39	43	49	10%
TOTAL APPLICATION SOFTWARE	124	5%	130	139	149	162	176	194	8%
TURNKEY SYSTEMS	327	10%	360	400	441	492	541	580	10%
SECTOR TOTAL	1148	12%	1283	1441	1617	1820	2041	2278	12%

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TRANSPORTATION INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	190	10%	209	230	264	309	365	427	15%
FACILITY MANAGEMENT	26	4%	27	28	30	31	33	34	5%
TOTAL PROCESSING SERVICES	216	9%	236	258	294	340	398	461	14%
APPLICATION SOFTWARE									
MAINFRAME/MINI	110	20%	132	158	170	228	274	328	20%
MICRO	22	41%	31	47	65	81	99	119	31%
TOTAL APPLICATION SOFTWARE	132	23%	163	205	235	309	373	447	22%
TURNKEY SYSTEMS	120	21%	145	171	206	248	300	358	20%
SECTOR TOTAL	468	16%	544	634	735	897	1071	1266	18%

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EXHIBIT V-B-17

UTILITIES INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	108	8%	117	126	137	150	165	181	9%
FACILITY MANAGEMENT	20	5%	21	23	25	28	33	38	13%
TOTAL PROCESSING SERVICES	128	8%	138	149	162	178	198	219	10%
APPLICATION SOFTWARE									
MAINFRAME/MINI	75	11%	83	91	100	110	129	152	13%
MICRO	33	18%	39	47	58	71	90	115	24%
TOTAL APPLICATION SOFTWARE	108	13%	122	138	158	181	219	267	17%
TURNKEY SYSTEMS	26	12%	29	32	36	40	45	51	12%
SECTOR TOTAL	262	10%	289	319	356	399	462	537	13%

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EXHIBIT V-B-18

TELECOMMUNICATIONS INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	340	16%	394	473	558	652	766	910	18%
FACILITY MANAGEMENT	17	18%	20	23	32	37	43	50	20%
TOTAL PROCESSING SERVICES	357	16%	414	496	590	689	809	960	18%
APPLICATION SOFTWARE									
MAINFRAME/MINI	42	36%	57	81	113	156	213	287	38%
MICRO	7	57%	11	15	24	35	51	76	47%
TOTAL APPLICATION SOFTWARE	49	39%	68	96	137	191	264	363	40%
TURNKEY SYSTEMS	199	18%	235	279	338	411	497	606	21%
SECTOR TOTAL	605	19%	717	871	1065	1291	1570	1929	22%

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DISTRIBUTION INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	773	14%	883	1015	1185	1396	1592	1767	15%
FACILITY MANAGEMENT	48	6%	51	54	58	62	68	73	7%
TOTAL PROCESSING SERVICES	821	14%	934	1069	1243	1458	1660	1840	15%
APPLICATION SOFTWARE									
MAINFRAME/MINI	215	29%	277	357	461	595	767	902	27%
MICRO	77	38%	106	148	205	272	358	464	34%
TOTAL APPLICATION SOFTWARE	292	31%	383	505	666	867	1125	1366	29%
TURNKEY SYSTEMS	451	25%	564	703	865	1009	1146	1294	18%
SECTOR TOTAL	1564	20%	1881	2277	2774	3334	3931	4500	19%

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EXHIBIT V-B-20

RETAIL INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	564	17%	659	776	932	1127	1310	1471	17%
FACILITY MANAGEMENT	16	13%	18	20	23	26	31	35	14%
TOTAL PROCESSING SERVICES	580	17%	677	796	955	1153	1341	1506	17%
APPLICATION SOFTWARE									
MAINFRAME/MINI	72	32%	95	129	172	231	308	361	31%
MICRO	32	47%	47	71	105	142	190	248	39%
TOTAL APPLICATION SOFTWARE	104	37%	142	200	277	373	498	609	34%
TURNKEY SYSTEMS	227	30%	295	380	484	560	625	690	19%
TOTAL	911	22%	1114	1376	1716	2086	2464	2805	20%

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WHOLESALE INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	209	7%	224	239	253	269	282	296	6%
FACILITY MANAGEMENT	32	3%	33	34	35	36	37	38	3%
TOTAL PROCESSING SERVICES	241	7%	257	273	288	305	319	334	5%
APPLICATION SOFTWARE									
MAINFRAME/MINI	143	27%	182	228	289	364	459	541	24%
MICRO	45	31%	59	77	100	130	168	216	30%
TOTAL APPLICATION SOFTWARE	188	28%	241	305	389	494	627	757	26%
TURNKEY SYSTEMS	224	20%	269	323	381	449	521	604	18%
TOTAL	653	17%	767	901	1058	1248	1467	1695	17%

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EXHIBIT V-B-22

BANKING AND FINANCE INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	2350	17%	2757	3135	3605	4145	4810	5470	15%
FACILITY MANAGEMENT	848	16%	980	1120	1280	1470	1705	1975	15%
TOTAL PROCESSING SERVICES	3198	17%	3737	4255	4885	5615	6515	7445	15%
APPLICATION SOFTWARE									
MAINFRAME/MINI	770	22%	940	1135	1375	1677	2115	2540	22%
MICRO	90	34%	121	167	230	299	390	470	31%
TOTAL APPLICATION SOFTWARE	860	23%	1061	1302	1605	1976	2505	3010	23%
TURNKEY SYSTEMS	630	14%	720	815	930	1070	1245	1440	15%
SECTOR TOTAL	4688	18%	5518	6372	7420	8661	10265	11895	17%

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EXHIBIT V-B-23

COMMERCIAL BANKING SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	1280	17%	1500	1723	1980	2340	2760	3190	16%
FACILITY MANAGEMENT	563	18%	665	760	865	995	1150	1340	15%
TOTAL PROCESSING SERVICES	1843	17%	2165	2483	2845	3335	3910	4530	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	570	24%	705	855	1040	1280	1615	1975	23%
MICRO	50	38%	69	96	127	168	225	275	32%
TOTAL APPLICATION SOFTWARE	620	25%	774	951	1167	1448	1840	2250	24%
TURNKEY SYSTEMS	349	17%	408	473	550	640	750	885	17%
TOTAL	2812	19%	3347	3907	4562	5423	6500	7665	18%

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EXHIBIT V-B-24

SAVINGS AND LOAN INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	350	14%	400	460	530	610	720	754	14%
FACILITY MANAGEMENT	72	11%	80	89	99	106	129	145	13%
TOTAL PROCESSING SERVICES	422	14%	480	549	629	716	849	899	13%
APPLICATION SOFTWARE									
MAINFRAME/MINI	120	21%	145	168	200	250	325	360	20%
MICRO	24	25%	30	40	56	70	90	110	30%
TOTAL APPLICATION SOFTWARE	144	22%	175	208	256	320	415	470	22%
TURNKEY SYSTEMS	109	10%	120	133	149	169	184	200	11%
TOTAL	675	15%	775	890	1034	1205	1448	1569	15%

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EXHIBIT V-B-25

SECURITIES AND COMMODITIES INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	375	17%	440	505	580	670	780	830	14%
FACILITY MANAGEMENT	126	14%	144	164	181	206	253	280	14%
TOTAL PROCESSING SERVICES	501	17%	584	669	761	876	1033	1110	14%
APPLICATION SOFTWARE									
MAINFRAME/MINI	40	25%	50	62	72	82	100	115	18%
MICRO	9	33%	12	15	21	27	36	45	30%
TOTAL APPLICATION SOFTWARE	49	27%	62	77	93	109	136	160	21%
TURNKEY SYSTEMS	116	13%	131	150	170	195	219	240	13%
TOTAL	666	17%	777	896	1024	1180	1388	1510	14%

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EXHIBIT V-B-26

OTHER BANKING AND FINANCE INDUSTRY SEGMENT
USER-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	345	21%	417	447	515	525	550	696	11%
FACILITY MANAGEMENT	87	5%	91	107	135	163	173	210	18%
TOTAL PROCESSING SERVICES	432	18%	508	554	650	688	723	906	12%
APPLICATION SOFTWARE									
MAINFRAME/MINI	40	0%	40	50	63	65	75	90	18%
MICRO	7	43%	10	16	26	34	39	40	32%
TOTAL APPLICATION SOFTWARE	47	6%	50	66	89	99	114	130	21%
TURNKEY SYSTEMS	56	9%	61	59	61	66	92	115	14%
TOTAL	535	16%	619	679	800	853	929	1151	13%

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EXHIBIT V-B-27

INSURANCE INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	304	12%	339	383	430	485	564	626	13%
FACILITY MANAGEMENT	325	10%	357	394	449	502	558	619	12%
TOTAL PROCESSING SERVICES	629	11%	696	777	879	987	1122	1245	12%
APPLICATION SOFTWARE									
MAINFRAME/MINI	230	15%	265	304	346	391	451	525	15%
MICRO	81	25%	101	135	176	225	282	345	28%
TOTAL APPLICATION SOFTWARE	311	18%	366	439	522	616	733	870	19%
TURNKEY SYSTEMS	164	18%	193	230	281	342	411	480	20%
SECTOR TOTAL	1104	14%	1255	1446	1682	1945	2266	2595	16%

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EXHIBIT V-B-28

LIFE AND HEALTH INSURANCE INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	146	12%	163	189	218	253	302	327	15%
FACILITY MANAGEMENT	296	10%	325	359	409	457	508	563	12%
TOTAL PROCESSING SERVICES	442	10%	488	548	627	710	810	890	13%
APPLICATION SOFTWARE									
MAINFRAME/MINI	108	16%	125	142	160	179	205	240	14%
MICRO	46	26%	58	78	102	132	168	203	28%
TOTAL APPLICATION SOFTWARE	154	19%	183	220	262	311	373	443	19%
TURNKEY SYSTEMS	75	19%	89	108	134	166	202	232	21%
TOTAL	671	13%	760	876	1023	1187	1385	1565	16%

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EXHIBIT V-B-29

PROPERTY/CASUALTY INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	58	10%	64	74	85	98	116	126	15%
FACILITY MANAGEMENT	10	10%	11	12	13	15	17	19	12%
TOTAL PROCESSING SERVICES	68	10%	75	86	98	113	133	145	14%
APPLICATION SOFTWARE									
MAINFRAME/MINI	81	15%	93	107	122	139	161	187	15%
MICRO	26	23%	32	44	58	75	95	115	29%
TOTAL APPLICATION SOFTWARE	107	17%	125	151	180	214	256	302	19%
TURNKEY SYSTEMS	26	19%	31	37	46	57	69	80	21%
TOTAL	201	15%	231	274	324	384	458	527	18%

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EXHIBIT V-B-30

OTHER INSURANCE INDUSTRIES SEGMENT
USER-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	100	12%	112	120	127	134	146	173	9%
FACILITY MANAGEMENT	19	11%	21	23	27	30	33	37	12%
TOTAL PROCESSING SERVICES	119	12%	133	143	154	164	179	210	10%
APPLICATION SOFTWARE									
MAINFRAME/MINI	41	15%	47	55	64	73	85	98	16%
MICRO	9	22%	11	13	16	18	19	27	20%
TOTAL APPLICATION SOFTWARE	50	16%	58	68	80	91	104	125	17%
TURNKEY SYSTEMS	63	16%	73	85	101	119	140	168	18%
TOTAL	232	14%	264	296	335	374	423	503	14%

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EXHIBIT V-B-31

MEDICAL INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMPUTING	601	18%	708	822	945	1103	1295	1516	16%
FACILITY MANAGEMENT	327	16%	379	443	519	602	698	816	17%
TOTAL PROCESSING SERVICES	928	17%	1087	1265	1464	1705	1993	2332	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	252	45%	366	512	717	997	1365	1638	35%
MICRO	44	64%	72	113	180	265	392	529	49%
TOTAL APPLICATION SOFTWARE	296	48%	438	625	897	1262	1757	2167	38%
TURNKEY SYSTEMS	516	17%	604	713	841	992	1181	1394	18%
SECTOR TOTAL	1740	22%	2129	2603	3202	3959	4931	5893	23%

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EXHIBIT V-B-32

HOSPITAL INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	505	17%	593	685	783	910	1071	1256	16%
FACILITY MANAGEMENT	268	16%	310	362	425	493	574	669	17%
TOTAL PROCESSING SERVICES	773	17%	903	1047	1208	1403	1645	1925	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	207	43%	296	410	566	778	1078	1294	34%
MICRO	29	55%	45	67	101	140	220	297	46%
TOTAL APPLICATION SOFTWARE	236	44%	341	477	667	918	1298	1591	36%
TURNKEY SYSTEMS	397	17%	463	543	637	748	895	1056	18%
TOTAL	1406	21%	1707	2067	2512	3069	3838	4572	22%

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EXHIBIT V-B-33

PHYSICIANS/PROFESSIONAL INDUSTRY SEGMENT
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	84	20%	101	121	142	170	198	231	18%
FACILITY MANAGEMENT	52	19%	62	72	85	98	111	131	16%
TOTAL PROCESSING SERVICES	136	20%	163	193	227	268	309	362	17%
APPLICATION SOFTWARE									
MAINFRAME/MINI	38	50%	57	83	120	173	229	275	37%
MICRO	13	85%	24	41	70	111	153	206	54%
TOTAL APPLICATION SOFTWARE	51	59%	81	124	190	284	382	481	43%
TURNKEY SYSTEMS	103	19%	123	148	178	214	250	295	19%
TOTAL	290	27%	367	465	595	766	941	1138	25%

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EXHIBIT V-B-34

OTHER MEDICAL INDUSTRY SEGMENT
USER-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	19	11%	21	25	29	34	39	45	16%
APPLICATION SOFTWARE									
MAINFRAME/MINI	7	86%	13	19	31	46	58	69	40%
MICRO	2	50%	3	5	9	14	19	26	54%
TOTAL APPLICATION SOFTWARE	9	78%	16	24	40	60	77	95	43%
TURNKEY SYSTEMS	16	13%	18	22	26	30	36	43	19%
TOTAL	44	25%	55	71	95	124	152	183	27%

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EDUCATION INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	101	11%	112	124	138	153	169	188	11%
FACILITY MANAGEMENT	19	5%	20	21	22	23	24	25	5%
TOTAL PROCESSING SERVICES	120	10%	132	145	160	176	193	213	10%
APPLICATION SOFTWARE									
MAINFRAME/MINI	25	12%	28	32	36	41	46	52	13%
MICRO	43	23%	53	65	78	93	109	126	19%
TOTAL APPLICATION SOFTWARE	68	19%	81	97	114	134	155	178	17%
TURNKEY SYSTEMS	90	14%	103	119	137	160	181	201	14%
SECTOR TOTAL	278	14%	316	361	411	470	529	592	13%

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EXHIBIT V-B-36

SERVICES INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	850	14%	969	1095	1237	1398	1580	1785	13%
FACILITY MANAGEMENT	7	0%	7	7	8	8	8	8	3%
TOTAL PROCESSING SERVICES	857	14%	976	1102	1245	1406	1588	1793	13%
APPLICATION SOFTWARE									
MAINFRAME/MINI	86	22%	105	127	154	186	225	272	21%
MICRO	24	25%	30	38	48	61	77	98	27%
TOTAL APPLICATION SOFTWARE	110	23%	135	165	202	247	302	370	22%
TURNKEY SYSTEMS	338	17%	395	465	599	650	760	880	17%
SECTOR TOTAL	1305	15%	1506	1732	2046	2303	2650	3043	15%

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FEDERAL GOVERNMENT INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	54	33%	72	75	84	87	84	102	7%
FACILITY MANAGEMENT	189	13%	213	223	252	272	301	330	9%
TOTAL PROCESSING SERVICES	243	17%	285	298	336	359	385	432	9%
APPLICATION SOFTWARE									
MAINFRAME/MINI	50	18%	59	66	74	85	106	130	17%
MICRO	12	25%	15	16	18	21	26	32	16%
TOTAL APPLICATION SOFTWARE	62	19%	74	82	92	106	132	162	17%
TURNKEY SYSTEMS	276	24%	342	414	504	606	720	846	20%
SECTOR TOTAL	581	21%	701	794	932	1071	1237	1440	15%
OTHER EXPENDITURE BREAKDOWN									
PROFESSIONAL SERVICES									
SOFTWARE DEVELOPEMENT	850	13%	961	1078	1220	1285	1443	1652	11%
CONSULTING	305	16%	355	370	390	430	450	480	6%
EDUCATION & TRAINING	250	8%	270	300	330	370	400	410	9%
SYSTEMS INTEGRATION	789	15%	904	1026	1189	1399	1634	1924	16%
FACILITY MANAGEMENT	570	30%	740	800	860	930	990	1070	8%
TOTAL PROFESSIONAL SERVICES	2764	17%	3230	3574	3989	4414	4917	5536	11%

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EXHIBIT V-B-38

STATE AND LOCAL GOVERNMENT INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMP/BATCH	110	20%	132	158	190	228	273	328	20%
FACILITY MANAGEMENT	296	16%	343	401	473	559	659	710	16%
TOTAL PROCESSING SERVICES	406	17%	475	559	663	787	932	1038	17%
APPLICATION SOFTWARE									
MAINFRAME/MINI	35	11%	39	45	52	60	70	82	16%
MICRO	10	30%	13	16	20	25	31	38	24%
TOTAL APPLICATION SOFTWARE	45	16%	52	61	72	85	101	120	18%
TURNKEY SYSTEMS	93	18%	110	130	156	188	227	272	20%
SECTOR TOTAL	544	17%	637	750	891	1060	1260	1430	18%

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OTHER INDUSTRIES INDUSTRY SECTOR
INDUSTRY-SPECIFIC SERVICES MARKET, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES									
REMOTE COMPUTING	493	12%	552	618	686	762	838	922	11%
FACILITY MANAGEMENT	9	11%	10	10	11	12	13	13	5%
TOTAL PROCESSING SERVICES	502	12%	562	628	697	774	851	935	11%
APPLICATION SOFTWARE									
MAINFRAME/MINI	63	32%	83	109	141	183	237	306	30%
MICRO	5	60%	8	12	18	27	39	57	48%
TOTAL APPLICATION SOFTWARE	68	34%	91	121	159	210	276	363	32%
TURNKEY SYSTEMS	99	22%	121	147	177	212	250	295	20%
SECTOR TOTAL	669	16%	774	896	1033	1196	1377	1593	16%

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EXHIBIT V-B-40

PLANNING AND ANALYSIS SEGMENT
CROSS-INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH	250	0%	250	246	241	237	231	225	-2%
APPLICATION SOFTWARE									
MAINFRAME/MINI	603	10%	663	710	785	864	961	1076	10%
MICRO	686	13%	775	890	992	1104	1276	1445	13%
TOTAL APPLICATION SOFTWARE	1289	12%	1438	1600	1777	1968	2237	2521	12%
TURNKEY SYSTEMS	242	10%	266	297	346	374	401	425	10%
CROSS-INDUSTRY TOTAL	1781	10%	1954	2143	2364	2579	2869	3171	10%

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EXHIBIT V-B-41

ACCOUNTING SEGMENT
CROSS-INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMP/BATCH	1030	2%	1051	1072	1093	1115	1137	1160	2%
APPLICATION SOFTWARE									
MAINFRAME/MINI	810	9%	883	962	1049	1143	1246	1359	9%
MICRO	234	20%	281	337	404	485	563	642	18%
TOTAL APPLICATION SOFTWARE	1044	11%	1164	1299	1453	1628	1809	2001	11%
TURNKEY SYSTEMS	358	10%	394	433	476	519	561	600	10%
CROSS-INDUSTRY TOTAL	2432	7%	2609	2804	3022	3262	3507	3761	8%

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EXHIBIT V-B-42

HUMAN RESOURCES SEGMENT
CROSS-INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH	893	11%	992	1111	1252	1420	1598	1789	13%
APPLICATION SOFTWARE									
MAINFRAME/MINI	410	18%	485	563	630	670	700	720	8%
MICRO	30	23%	37	45	55	67	82	100	22%
TOTAL APPLICATION SOFTWARE	440	19%	522	608	685	737	782	820	9%
TURNKEY SYSTEMS	190	14%	217	245	274	304	335	365	11%
CROSS-INDUSTRY TOTAL	1523	14%	1731	1964	2211	2461	2715	2974	11%

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EXHIBIT V-B-43

ENGINEERING AND SCIENTIFIC SEGMENT
CROSS-INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH	250	5%	263	276	289	304	319	335	5%
APPLICATION SOFTWARE									
MAINFRAME/MINI	150	24%	186	231	286	355	440	545	24%
MICRO	32	31%	42	55	72	94	123	162	31%
TOTAL APPLICATION SOFTWARE	182	25%	228	286	358	449	563	707	25%
TURNKEY SYSTEMS	280	15%	322	370	426	490	563	648	15%
CROSS-INDUSTRY TOTAL	712	14%	813	932	1073	1243	1445	1690	16%

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EXHIBIT V-B-44

EDUCATION AND TRAINING SEGMENT
CROSS-INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH	80	11%	89	98	106	115	123	130	8%
APPLICATION SOFTWARE									
MAINFRAME/MINI	30	23%	37	46	55	65	76	88	19%
MICRO	40	25%	50	64	77	93	117	148	24%
TOTAL APPLICATION SOFTWARE	70	24%	87	110	132	158	193	236	22%
TURNKEY SYSTEMS	120	14%	137	156	176	197	221	248	13%
CROSS-INDUSTRY TOTAL	270	16%	313	364	414	470	537	614	14%

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EXHIBIT V-B-45

OTHER CROSS-INDUSTRY SEGMENT
CROSS- INDUSTRY SERVICES MARKET
BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
REMOTE COMPUTING/BATCH	620	3%	641	665	693	726	765	810	5%
APPLICATION SOFTWARE									
MAINFRAME/MINI	218	21%	263	316	384	479	598	732	23%
MICRO	439	22%	535	650	792	982	1198	1545	24%
TOTAL APPLICATION SOFTWARE	657	21%	798	966	1176	1461	1796	2277	23%
TURNKEY SYSTEMS	1042	9%	1140	1245	1332	1489	1632	1823	10%
CROSS-INDUSTRY TOTAL	2319	11%	2579	2876	3201	3676	4193	4910	14%

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APPENDIX C: FORECAST RECONCILIATION

- This section analyzes the important differences between INPUT's 1985 and 1986 forecasts (see Exhibits V-C-1 through V-C-21).

- The overall market slowdown in late 1985 and early 1986 contributed to the majority of differences between the forecasts in both the 1985 user expenditures and overall five-year AAGRs.

  - The overall market, however, had only a 3% change (decrease) in user expenditures comparing the 1985 and 1986 forecasts.

  - In spite of the fact that the growth rate was lowered in the 1986 forecast (from 22% to 18%), as mentioned in the IS overview section of this report, the market is still experiencing healthy growth, especially compared to other segments of the economy.

- In the processing/network services market, most segments had a small decrease in 1985 base and 1990 market. The exception to this is the cross-industry segment which was impacted by changes in the engineering and scientific market.

  - INPUT has made a significant adjustment in the size of the market for engineering/scientific processing services. To avoid double counting, the cross-industry engineering and scientific processing services sold to the discrete manufacturing industry have been largely subtracted. It

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RECONCILIATION OF INFORMATION SERVICES MARKETS BY DELIVERY MODE

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH								
INDUSTRY SPECIFIC	7827	7456	5%	17512	14984	17%	17%	15%
CROSS INDUSTRY	4852	3845	26%	10408	6326	65%	16%	11%
UTILITY PROCESSING	1896	2066	-8%	2437	2911	-16%	6%	7%
SUBTOTAL	14575	13367	9%	30357	24221	25%	16%	13%
FACILITIES MANAGEMENT								
INDUSTRY SPECIFIC	2151	2215	-3%	4436	4294	3%	16%	14%
CROSS INDUSTRY	60	60	0%	71	71	0%	3%	4%
UTILITY PROCESSING	156	156	0%	332	332	0%	16%	17%
SUBTOTAL	2367	2431	-3%	4839	4697	3%	15%	14%
TOTAL PROCESSING SERVICES								
INDUSTRY SPECIFIC	9978	9671	3%	21948	19278	14%	17%	15%
CROSS INDUSTRY	4912	3905	26%	10479	6397	64%	16%	11%
UTILITY PROCESSING	2052	2222	-8%	2869	3243	-12%	7%	8%
VANS	368	308	19%	1270	1115	14%	28%	28%
TOTAL	17310	16106	7%	36566	30033	22%	16%	13%
SOFTWARE PRODUCTS								
APPLICATION SOFTWARE PRODUCTS								
INDUSTRY SPECIFIC	3224	3242	-1%	12784	10238	25%	30%	25%
CROSS INDUSTRY	3740	3682	2%	8766	7380	19%	29%	15%
TOTAL APPLICATIONS SOFTWARE	6964	6924	1%	21550	17618	22%	25%	21%
TOTAL SYSTEM SOFTWARE	6322	6085	4%	19651	16826	17%	25%	24%
TOTAL SOFTWARE	13286	13009	2%	41201	34444	20%	25%	22%
TOTAL PROFESSIONAL SERVICES	10529	10571	0%	26315	24181	9%	20%	18%
TURNKEY SYSTEMS								
INDUSTRY SPECIFIC	5070	4810	5%	12646	11313	12%	20%	19%
CROSS INDUSTRY	2327	2232	4%	4721	3713	27%	15%	11%
TOTAL TURNKEY SYSTEMS	7397	7042	5%	17367	15026	16%	19%	16%
GRAND TOTAL	48522	46728	4%	121449	103684	17%	22%	18%

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EXHIBIT V-C-2

RECONCILIATION OF DISCRETE MANUFACTURING SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	781	525	49%	1842	1218	51%	19%	19%
FACILITY MANAGEMENT	44	44	0%	92	92	0%	16%	16%
TOTAL PROCESSING SERVICES	825	569	45%	1934	1310	48%	19%	19%
APPLICATION SOFTWARE	717	717	0%	2120	2120	0%	24%	25%
TURNKEY SYSTEMS	1481	1481	0%	3810	3809	0%	21%	21%

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EXHIBIT V-C-3

RECONCILIATION OF PROCESS MANUFACTURING SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	765	657	16%	1606	1265	27%	16%	14%
FACILITY MANAGEMENT	46	40	15%	102	59	73%	17%	7%
TOTAL PROCESSING SERVICES	811	697	16%	1708	1324	29%	16%	14%
APPLICATION SOFTWARE	160	124	29%	852	176	384%	40%	8%
TURNKEY SYSTEMS	340	327	4%	655	541	21%	14%	10%

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EXHIBIT V-C-4

RECONCILIATION OF TRANSPORTATION SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	190	190	0%	475	427	11%	20%	15%
FACILITY MANAGEMENT	26	26	0%	33	34	-3%	5%	5%
TOTAL PROCESSING SERVICES	216	216	0%	508	461	10%	19%	14%
APPLICATION SOFTWARE	132	132	0%	763	447	71%	42%	22%
TURNKEY SYSTEMS	123	120	3%	305	358	-15%	20%	20%

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EXHIBIT V-C-5

RECONCILIATION OF UTILITIES SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	133	108	23%	226	165	37%	11%	9%
FACILITY MANAGEMENT	12	20	-40%	19	33	-42%	10%	13%
TOTAL PROCESSING SERVICES	145	128	13%	245	198	24%	11%	10%
APPLICATION SOFTWARE	26	108	-76%	91	219	-58%	28%	17%
TURNKEY SYSTEMS	40	26	54%	98	45	118%	20%	12%

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EXHIBIT V-C-6

RECONCILIATION OF TELECOMMUNICATIONS SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	340	340	0%	745	766	-3%	17%	18%
FACILITY MANAGEMENT	18	17	6%	40	43	-7%	17%	20%
TOTAL PROCESSING SERVICES	358	357	0%	785	809	-3%	17%	18%
APPLICATION SOFTWARE	47	49	-4%	260	264	-2%	41%	40%
TURNKEY SYSTEMS	199	199	0%	500	497	1%	20%	21%

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EXHIBIT V-C-7

RECONCILIATION OF DISTRIBUTION SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	773	773	0%	1765	1592	11%	18%	15%
FACILITY MANAGEMENT	47	48	-2%	109	68	60%	18%	7%
TOTAL PROCESSING SERVICES	820	821	0%	1874	1660	13%	18%	15%
APPLICATION SOFTWARE	337	292	15%	1440	1125	28%	34%	29%
TURNKEY SYSTEMS	422	451	-6%	1041	1146	-9%	20%	18%

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EXHIBIT V-C-8

RECONCILIATION OF BANKING AND FINANCE SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	2411	2350	3%	5583	4810	16%	18%	15%
FACILITY MANAGEMENT	898	848	6%	1900	1705	11%	16%	15%
TOTAL PROCESSING SERVICES	3309	3198	3%	7483	6515	15%	18%	15%
APPLICATION SOFTWARE	939	860	9%	3466	2505	38%	30%	23%
TURNKEY SYSTEMS	644	630	2%	1473	1245	18%	18%	15%

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EXHIBIT V-C-9

RECONCILIATION OF INSURANCE SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	304	304	0%	564	564	0%	13%	13%
FACILITY MANAGEMENT	319	325	-2%	558	558	0%	12%	12%
TOTAL PROCESSING SERVICES	623	629	-1%	1122	1122	0%	12%	12%
APPLICATION SOFTWARE	286	311	-8%	912	733	24%	26%	19%
TURNKEY SYSTEMS	164	164	0%	411	411	0%	20%	20%

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EXHIBIT V-C-10

RECONCILIATION OF MEDICAL SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	601	601	0%	1295	1295	0%	17%	16%
FACILITY MANAGEMENT	387	327	18%	698	698	0%	17%	17%
TOTAL PROCESSING SERVICES	988	928	6%	1993	1993	0%	17%	16%
APPLICATION SOFTWARE	296	296	0%	1757	1757	0%	43%	38%
TURNKEY SYSTEMS	516	516	0%	1181	1181	0%	18%	18%

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EXHIBIT V-C-11

RECONCILIATION OF EDUCATION SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	53	101	-48%	90	169	-47%	11%	11%
FACILITY MANAGEMENT	19	19	0%	24	24	0%	5%	5%
TOTAL PROCESSING SERVICES	72	120	-40%	114	193	-41%	10%	10%
APPLICATION SOFTWARE	58	68	-15%	205	155	32%	29%	17%
TURNKEY SYSTEMS	91	90	1%	215	181	19%	19%	14%

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EXHIBIT V-C-12

RECONCILIATION OF SERVICES SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	853	850	0%	1900	1580	20%	17%	13%
FACILITY MANAGEMENT	6	7	-14%	12	8	50%	15%	3%
TOTAL PROCESSING SERVICES	859	857	0%	1912	1588	20%	17%	13%
APPLICATION SOFTWARE	110	110	0%	504	302	67%	36%	22%
TURNKEY SYSTEMS	355	338	5%	1256	760	65%	29%	17%

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EXHIBIT V-C-13

RECONCILIATION OF FEDERAL GOVERNMENT SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
TOTAL PROCESSING SERVICES	155	243	-36%	362	385	-6%	18%	9%
TOTAL APPLICATION SOFTWARE	30	62	-52%	55	132	-58%	22%	17%
TURNKEY SYSTEMS	503	276	82%	1230	720	71%	20%	20%

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EXHIBIT V-C-14

RECONCILIATION OF STATE AND LOCAL GOVERNMENT SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	59	110	-46%	160	328	-51%	22%	20%
FACILITY MANAGEMENT	296	296	0%	659	710	-7%	17%	16%
TOTAL PROCESSING SERVICES	355	406	-13%	819	1038	-21%	18%	17%
APPLICATION SOFTWARE	28	45	-38%	101	120	-16%	25%	18%
TURNKEY SYSTEMS	93	93	0%	274	272	1%	20%	20%

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EXHIBIT V-C-15

RECONCILIATION OF OTHER INDUSTRIES INDUSTRY SECTOR INDUSTRY-SPECIFIC MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES								
REMOTE COMPUTING/BATCH SERV.	493	493	0%	1075	838	28%	17%	11%
FACILITY MANAGEMENT	9	9	0%	14	13	8%	9%	5%
TOTAL PROCESSING SERVICES	502	502	0%	1089	851	28%	17%	11%
APPLICATION SOFTWARE	68	68	0%	275	276	0%	32%	32%
TURNKEY SYSTEMS	99	99	0%	244	250	-2%	20%	20%

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EXHIBIT V-C-16

RECONCILIATION OF PLANNING AND ANALYSIS SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	829	250	232%	1626	231	604%	14%	-2%
APPLICATION SOFTWARE								
MAINFRAME/MINI	603	603	0%	1596	961	66%	21%	10%
MICRO	686	686	0%	1294	1276	1%	14%	13%
TOTAL APPLICATION SOFTWARE	1289	1289	0%	2890	2237	29%	18%	12%
TURNKEY SYSTEMS	242	242	0%	602	401	50%	20%	10%

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EXHIBIT V-C-17

RECONCILIATION OF ACCOUNTING SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	1033	1030	0%	2058	1137	81%	15%	2%
APPLICATION SOFTWARE								
MAINFRAME/MINI	912	810	13%	1785	1246	43%	14%	9%
MICRO	267	234	14%	820	563	46%	25%	18%
TOTAL APPLICATION SOFTWARE	1179	1044	13%	2605	1809	44%	17%	11%
TURNKEY SYSTEMS	376	358	5%	590	561	5%	20%	10%

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EXHIBIT V-C-18

RECONCILIATION OF HUMAN RESOURCES SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	893	893	0%	1598	1598	0%	12%	13%
APPLICATION SOFTWARE								
MAINFRAME/MINI	410	410	0%	768	700	10%	13%	8%
MICRO	40	30	33%	107	82	30%	22%	22%
TOTAL APPLICATION SOFTWARE	450	440	2%	875	782	12%	14%	9%
TURNKEY SYSTEMS	218	190	15%	414	335	24%	14%	11%

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RECONCILIATION OF ENGINEERING AND SCIENTIFIC SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	915	250	266%	1389	319	335%	18%	5%
APPLICATION SOFTWARE								
MAINFRAME/MINI	150	150	0%	488	440	11%	24%	24%
MICRO	32	32	0%	179	123	46%	31%	31%
TOTAL APPLICATION SOFTWARE	182	182	0%	667	563	18%	25%	25%
TURNKEY SYSTEMS	280	280	0%	785	563	39%	18%	15%

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EXHIBIT V-C-20

RECONCILIATION OF EDUCATION AND TRAINING SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	88	80	10%	148	123	20%	11%	8%
APPLICATION SOFTWARE								
MAINFRAME/MINI	30	30	0%	138	76	82%	36%	19%
MICRO	54	40	35%	383	117	227%	48%	24%
TOTAL APPLICATION SOFTWARE	84	70	20%	521	193	170%	44%	22%
TURNKEY SYSTEMS	122	120	2%	235	221	6%	14%	13%

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EXHIBIT V-C-21

RECONCILIATION OF OTHER CROSS-INDUSTRY SEGMENT CROSS-INDUSTRY MARKET FORECAST

DELIVERY MODE	1985 MARKET			1990 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
REMOTE COMPUTING/BATCH SERV.	372	620	-40%	710	765	-7%	14%	5%
APPLICATION SOFTWARE								
MAINFRAME/MINI	170	218	-22%	364	598	-39%	16%	23%
MICRO	386	439	-12%	950	1198	-21%	20%	24%
TOTAL APPLICATION SOFTWARE	556	657	-15%	1314	1796	-27%	19%	23%
TURNKEY SYSTEMS	1089	1042	5%	2230	1632	37%	15%	10%

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was deemed that those revenues had also been counted in discrete manufacturing industry-specific processing services. There is considerable overlap between the two sectors, and it is now apparent that many applications that were previously classified as cross-industry engineering and scientific are specific to discrete manufacturing.

- INPUT has reduced the forecasted growth rate of the engineering/scientific processing services market from 18% to 5%. The engineering community is increasingly bringing its computing work in-house. The increased performance and decreased cost of all computers, but primarily workstations and personal computers, has encouraged the acquisition and use of in-house computers. This process has dramatically cut into the use of outside processing services by engineers.

- A reconciliation between the software market forecasts made by INPUT in 1985 compared to the forecasts made in this report shows the base year (1985) numbers to be very similar. This reflects the overall stability of the software market as compared to other information service market segments. The 1990 forecasts decreased due to the impact the economic and corporate issues elaborated on in the preceding text, such as user confusion and the implementation bottleneck.

- The total adjustment from the 1985 forecast made to professional services user expenditures was a small $28 million. A dramatic adjustment, a reduction of $582 million, however, occurred in the federal government. Briefly, the adjustment reflects the substantial impact of increased expenditures for telecommunications equipment and services resulting from the AT&T divestiture. With much of the information technology funding committed to current contracts, federal agencies were forced to slow expenditures for planned contracted services, including professional services. New software development was impacted the most as noncritical improvements were delayed. Outyear variances reflect changes in the 1985 base

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discussed above and changes in the rate of growth. Overall, the professional services market has slowed as a result of the changing economic climate, and INPUT expects the market to be 10% smaller in 1990 than forecast last year.

- The turnkey market had a minor 5% overall decrease in the 1985 versus 1986 forecast. The 1990 market and the five-year forecast decreased due to the aforementioned negative driving forces.

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
ENGINEERING AND SCIENTIFIC SECTOR

MAY 1986

U.S. INFORMATION SERVICE
CROSS-INDUSTRY MARKETS, 1986-1991
ENGINEERING AND SCIENTIFIC SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- CAD/CAM/CAE is the major component of the types of applications that are offered in the engineering and scientific market. For example, under CAD/CAM, along with design and drafting applications, are also included such applications as structural analysis and structural engineering. However, for purposes of anlysis, a separate section is included for structural analysis applications. While the report focuses on the CAD/CAM/CAE segment of the market because it is the largest, most dynamic, and fastest growing, the forecasts also include scientific applications for such uses as biological research, statistical analysis, and linear programming.

- CAD/CAM includes a wide range of applications:

  - Mechanical design and drafting which includes finite element modeling and analysis, surface design, and solids modeling.

  - Electronic design which includes circuit analysis, schematic capture, schematic design-rule checking, and integrated circuit layout.

  - Architecture, engineering, and construction (AEC) which includes plant design, piping design and analysis, building design and management, mapping, and site engineering.

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- Computer-aided manufacturing which includes robot program design and simulation, and numerical control programming.

- CAD can stand for either computer-aided drafting or computer-aided design.

  - Computer-aided drafting provides basic drawing entry and editing. Schematic capture, mechanical drawings, and map entry are examples of this type of activity.

  - Computer-aided design performs design rule checks on drawings that have been entered. The design rule checks performed include checking for typographical errors, simple design mistakes, and for incomplete drawings. Examples include checking for spacing for parts, electrical overloads, unspecified sizes of parts, etc.

- In addition to designing products, engineers must also analyze the designs to make sure the products will perform as required. Computer-aided engineering (CAE) programs were designed to fulfill this role.

- Sometimes the terms CAD and CAE are used interchangeably because they are both design automation tools. However, there are important differences between the two:

  - CAE systems are used at the "front end," where products are conceived. They are used by engineers to automate the analysis and simulation of the design. In analysis and simulation, a mathematical or software model of the design is created and tested under various conditions. The results of these tests show what a physical model would do under the same conditions.

  - On the other hand, CAD systems are used to draw and analyze physical structures. They are typically employed at the "tail end" of the

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product development process where they are used to convert engineers' designs into production drawings.

- The engineering and scientific market is typified by work that spans many industry segments, yet is concentrated in manufacturing, both discrete and process.

- Approximately 17% of the total CAD/CAM/CAE turnkey systems is included in the engineering and scientific segment forecasts. The remainder is included in the discrete manufacturing, process manufacturing, utilities, transportation, federal government, and other sectors.

  - Likewise, the CAM portion is excluded from the analysis and forecasts in the engineering and scientific section. User expenditures for CAM sales are included in the discrete manufacturing industry sector.

  - Expenditures by architectural and engineering firms for applications that are designed specifically for that type of firm, as opposed to an application designed for engineers or architects in any type of firm, are included in the industry-specific services sector under architectural and engineering services.

B. CAD/CAM

- 1985 was one of the most turbulent years ever for the CAD/CAM industry. The turbulence is due in part to the massive influx of microcomputer-based products into what had previously been a mini and mainframe dominated market. PC-based systems have hurt sales of high-end systems priced at $50,000-120,000 per workstation. This new competition has forced the traditional leading manufacturers to counter with micro products of their own, but they have had trouble maintaining revenues in this unfamiliar segment of the market.

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- There are three major groups of CAD/CAM turnkey systems.

  - The first is a low-cost system that sells for less than $25,000. These systems are typically dedicated to a single task such as semiconductor design. The IBM PC/AT is the primary workstation for these products. These systems are typically limited to drafting and two-dimensional (2D) design capability.

  - The second group of systems have more than one graphics workstation linked together in a cluster. Such systems begin at around $100,000 and are suited to the needs of medium-sized firms with complex design needs.

  - The third group of CAD/CAM systems comprises the largest and most expensive equipment. These systems allow many designers to work on different portions of one project by using separate workstations that are connected to the central computer which updates and coordinates the whole design process. The high end of the market is growing at a slower rate than the other two groups.

- One significant impact of the rapid proliferation of low-cost workstation-based CAD and CAE systems is that the vendors can no longer afford the level of support and service that went with high profit margins associated with high-end systems. There is not enough margin in a $20,000 system (unless sold in volume) to accommodate a lengthy sales call and a lot of follow-up support.

- In addition to the move toward PC-based systems, the major trends in the CAD/CAM industry are:

  - Move toward open architecture.

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- Emergence of systems to integrate mechanical design, engineering, and shop floor manufacturing systems.

- Integration of data management and computing systems. An effective data base management environment is necessary for the integration of a multi-vendor information system.

- Communications across disparate workstations and computer systems from multiple vendors. In order to address these communication problems, CAD/CAM/CAE vendors are making major shifts in their workstation offerings toward systems based on emerging industry standards.

- Distributed solutions in a hierachical setting. The premise of a hierarchy of computing systems is that data management and archiving functions are performed at the host level and the interactive data management and design applications at the workstation level. The transition in the industry is still in progress.

- Back-end processors at a departmental level.

- Movement toward solids modeling and 3D capabilities.

- Introduction of more intelligence through the incorporation of expert systems.

- Greater involvement of senior management in the decision to buy a system. The strategic importance of CAD/CAM has been recognized; thus, people in the company are required to approve the purchase which lengthens the sales cycle.

- There is a move toward component CAD/CAM systems because customers that already have computers do not want to buy a complete

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CAD/CAM system that duplicates some of what they already own. Instead, they are likely to want separate CAD/CAM components such as software and graphics workstations that they can connect to their existing hardware.

C. CAE IN ELECTRONICS INDUSTRY

- The need for CAE tools in electronic design resulted from the increasing complexity of large-scale integrated circuits and the electronic systems incorporating such components. This increasing design complexity has significantly lengthened the product development cycle while, at the same time, more competition in the electronics industry has shortened product life cycles.

  - The primary user benefits of CAD/CAM/CAE systems are in producing products less expensively and, more importantly, developing them faster to take advantage of market windows.

  - CAE is used to improve the quality of design by simulating operational performance and to reduce the turnaround time for various phases of electronics engineering, including defining overall system architecture, logic circuit layout, design-rule checking, and timing simulation.

  - This implies that there will have to be significant links between the design function and the production function, and post-production issues such as product test and field service. Engineers want the design to go smoothly from CAD to CAE and then to CAM in a fully integrated system.

- There are about 3,000 chip designers in the world compared with about 400,000 systems designers. The integrated circuit designers were the initial

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purchasers of CAE tools. The trend is toward system design rather than chip design. CAE tools will be more gradually adopted by systems designers which will be accompanied by evolutionary changes in the characteristics of CAE tools and suppliers. Systems designers will require tools that are easier to learn and use and which address a broader range of electronic design applications. It takes a long time, even for a sophisticated IC designer, to learn how to use the current systems.

- A key issue facing CAE vendors now is data management, that is, the ability to move data through a particular vendor's system as well as the ability to transfer data from one vendor's system to another. However, because of the sheer volume of data and the assortment of formats used, data management presents a formidable challenge to the industry.

- Currently, three companies dominate the CAE tools marketplace: Mentor Graphics, Daisy Systems, and Valid Logic Systems. The market forces facing these three leading CAE vendors are:

  - Customers are demanding easier-to-use systems that cost less.

  - Startup companies are offering PC-based systems.

  - Established instrument, CAD/CAM, and computer companies are suddenly attracted to the CAE market.

- Vendors that have either entered or have announced their intention of entering the CAE market include:

  - Tektronix, a leading instrumentation company, who recently acquired CAE Systems, Inc. of Sunnyvale.

  - Hewlett-Packard, which has floundered in its attempts to develop CAE software, recently purchased a CAE software company--Cericor Inc. of Salt Lake City.

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- The CAD/CAM companies, led by Computervision, Intergraph, General Electric's Calma subsidiary, and Schlumberger's Applicon division, have already begun encroaching on the CAE market.

- AT&T and IBM, with their own advanced internal CAE tools, could each be a major force in the market if they so chose.

- However, all has not gone well for these new entrants.

  - Companies like Hewlett-Packard and Tektronix have barely gained a toehold in CAE.

  - The established CAD vendors have had trouble moving into CAE as well. Both Computervision and Calma bought small CAE startups to help them move into chip design systems, but marketing and technical problems have hampered their product introductions.

- It takes a major investment of both time and resources to successfully penetrate this market. The software involved is very complex and, as H-P and Tektronix have discovered, more difficult and time consuming than anticipated. One cannot rush into the market with a CAE application.

  - In addition, an ever increasing number of product features are required to enter this market. Additional features that have been added recently to CAE systems include PCB layout, ATE (automatic test equipment) interfaces, silicon compilation, and standard cell layout.

  - The newer CAE products integrate the once independent functions of design, design verification, layout, and test generation, thereby easing the bottlenecks in the design-to-production process.

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D. STRUCTURAL ANALYSIS

- Structural analysis and modeling is of interest to a diverse range of customer segments, including the aerospace, automotive, and civil engineering industries. In general, engineering analysis involves the detailed simulation of structural behavior under a variety of operating conditions.

- Typically, such analysis involves the use of "finite element modeling" (FEM) techniques for solutions. Finite element analysis, the most widely used of the structural engineering techniques, divides the structural unit being modeled into a discrete number of well-defined elements--the finite elements. These elements are assumed to be connected to each other in simple geometric shapes that individually lend themselves to analysis. The geometric shapes are then added together to form the essential structure of the object. Using this technique, the behavior of complex shapes, such as an airplane wing or an automobile fender, can be studied.

- The commonality and generic appeal of FEM techniques applied to diverse applications had led to the development of industry standard software packages, such as ANSYS, NASTRAN, PATRAN, and STRUDL.

  - The most popular FEM software is MacNeal-Schwendler Corporation's MSC/NASTRAN, a continuously enhanced version of the original NASA Structural Analysis program currently licensed for a monthly fee to over 300 customers in aerospace, defense, energy, construction, and consumer products industries. The full-scale program is available from most RCS vendors that support engineering and can be leased by a corporation for use on its own mainframe or minicomputer.

  - Dozens of other structural simulation packages are available either in the public domain or for a fee from third parties, generally designed to aid in problem solving applicable to specific disciplines of engineering analysis.

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- The STRuctural Design Language (STRUDL) is an outgrowth of work done on computerized engineering techniques at MIT in the 1950s and 1960s. The early programs were in the public domain. Several software and RCS vendors have used this code as the basis of their own proprietary offerings. Proprietary STRUDLs offer greatly enhanced capability for analyzing complex structures under a wide variety of conditions. These packages feature automatic model generation, graphics model verification, automatic load generation, complete building code compliance, and member (element) redesign. McDonnell Douglas (MCD-ISG) offers a very popular and widely used version of STRUDL on its RCS service.

- In addition to the above, there are a number of widely available and highly regarded structural programs in use today, including:

  - ANSYS: developed and maintained by Swanson Analysis Systems, Inc. (Houston, PA).

  - EASE2: developed and maintained by Engineering Analysis Corporation (Torrance, CA).

  - MARC: developed and maintained by MARC Analysis Research Corporation (Palo Alto, CA).

  - STARDYNE: developed and maintained by Management Research Information (MRI) (San Jose, CA).

E. WORKSTATIONS

- The introduction of several significant new workstations created a large degree of change in a short amount of time. The personal computer proved

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widely popular, followed by the introduction of DEC's MicroVAX II, Motorola 68020 chips, DEC's VAXStation II/GPX, and the IBM PC/RT.

- Currently, Apollo is the leading workstation vendor, followed by Sun Microsystems, with DEC and IBM coming on strong. In short order, IBM and DEC will establish themselves as the two leading hardware platform suppliers in technical computing. Sun and Apollo will remain strong in engineering departments.

- There will be four major CAD/CAM/CAE workstation platforms accepted over the next few years:

  - IBM PC family (PC/XT, PC/AT, and successors).

  - Unix workstations (Apollo, Sun Microsystems, etc.).

  - DEC MicroVAX family.

  - IBM workstation family (the RT and successors).

- Support for the first three of these hardware platforms is almost universal among CAD/CAM and CAE system suppliers, while support for IBM's new RT workstation should appear gradually (and reluctantly) because software and system developers already have their hands full either developing for, or converting to, other machines.

- The low-cost workstations will dominate this market in terms of units sold. With a PC, CAD/CAM users can perform about 70-80% of their basic CAD/CAM needs at 10% of the cost. Moreover, since many engineers already have their own PC, they believe that all they have to do is buy an inexpensive microcomputer software CAD/CAM package (and perhaps a few add-ons) and they are all set. Although this is true in some instances, the desire for increased performance and features will continue unabated.

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- Today's workstation customers require links with existing computers (see discussion of integration in Chapter IV).

- The majority of engineers and scientists still do not have a workstation or personal computer. The biggest obstacle to getting these engineers to use a workstation and CAD/CAM applications is the initial cost involved.

F. SILICON COMPILERS

- One new technology with a great deal of promise that has so far failed to take off in the market is silicon compilers. A silicon compiler is a computer program that automatically designs a chip based on engineering descriptions of what the circuit should do. These compilers go beyond the capabilities offered by present CAE systems by actually doing the design of the chip. Despite much promise, the market for silicon compilers has not grown as quickly as expected.

- Silicon compilers began appearing in late 1984. Today, they are sold mainly by three small, private companies: Silicon Compilers Inc. (San Jose, CA); Seattle Silicon Technology (Bellevue, WA); and Silicon Design Labs (Liberty Corner, NJ).

- One established semiconductor company, LSI Logic, has recently entered the market with a silicon compiler based on a different concept. Rather than accepting the compromises in design that current products trying to automate the design of all types of chips are forced to make, LSI is developing a different compiler for each of the dozen or so major types of chips.

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- The reasons this market has failed to take off at this point are:

  - The electronics companies, their primary customers, have been in a slump.

  - While silicon compilers can do the design job faster than an engineer, they still do not do as good a job. Computer-designed chips waste more space on the silicon, making such chips more expensive to manufacture.

  - However, silicon compilers have a bright future. Because chips are becoming so complex, engineers can no longer do the design without the aid of a computer. There must be a way for a designer to deal with all of the intricacies of a complex integrated circuit, and silicon compilers offer one of the few, if not only, available solutions.

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II MARKET FORECASTS

- The four largest marketplaces for CAD systems are:

  - Mechanical design--this is the largest area, encompassing the aerospace and automobile industries.

  - Integrated and printed circuit board design--this includes primarily the electronics companies.

  - Civil engineering--this includes the construction industry. The primary use is for piping design and layout. Key users are oil and chemical companies and construction contractors that design and build refineries and chemical plants.

  - Mapping--this is used primarily by local and federal government agencies for municipal planning and public utility mapping. Natural resource firms are using CAD techniques for mapping seismic data on mineral deposits.

- The largest market for CAE is for electronics design, particularly for integrated circuit design.

- User expenditures for cross-industry engineering and scientific applications will grow 16% annually through 1991, increasing from $812 million in 1986 to $1.7 billion in 1991, as shown in Exhibit II-1.

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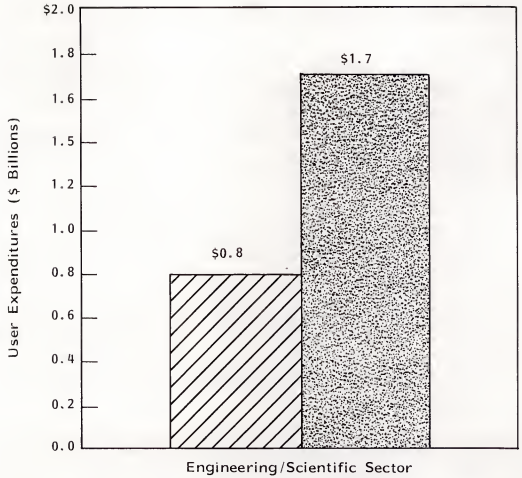
EXHIBIT II-1

ENGINEERING AND SCIENTIFIC SECTOR
INFORMATION SERVICES MARKETS, 1986-1991



Average Annual Growth Rate: 16%

1986

1991

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- One very promising area is remote computing services based on a supercomputer. Supercomputer processing services, such as Control Data Corporation's Cybernet service, provide the processing capabilities necessary for a number of applications such as wind tunnel simulation. This market should grow at a rate of 40% over the next two years.

- Forecasts for user expenditures by delivery mode are shown in Exhibit II-2. Application software sales will grow most rapidly at a rate of 25% as firms buy engineering/scientific software for their existing in-house computer systems.

- Appendix ES-A contains the forecast data base for each year, 1985-1991, by delivery mode.

- Exhibit II-3 lists the revenues of the leading turnkey CAD/CAM/CAE vendors. Vendors such as IBM, DEC, and Prime are excluded from this list because they sell hardware and software separately.

- The CAD/CAM industry is currently in a transition from the rapidly growing 1980-1985 period to an era of slower expansion. Expenditures outside the U.S., however, are expected to increase at a much faster rate (25% a year) than the U.S. market which will grow at only 16%.

- The reasons for the slowdown in growth include:

  - The initial period of rapid growth in the U.S. market has slowed as the "early adopter" phase has run its course and vendors face the more difficult task of selling to a new level of customers. The new customers want the CAD/CAM/CAE facility to be part of the overall computing facilities.

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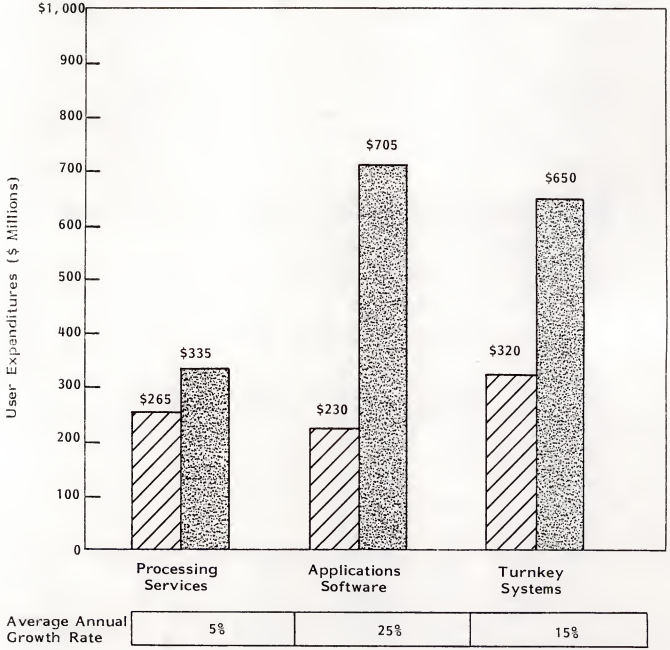
EXHIBIT II-2

ENGINEERING AND SCIENTIFIC SECTOR
INFORMATION SERVICES MARKET BY DELIVERY MODE, 1986-1991



Note: Some sectors included in the segment total are not broken out.

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EXHIBIT II-3

REVENUES OF LEADING TURNKEY VENDORS
OF CAD/CAE, 1985*

VENDOR	REVENUES ($ Millions)** WORLDWIDE	REVENUES ($ Millions) U.S.
Intergraph	$525	$362
Computervision	441	185
Calma	210	157
McDonnell Douglas	150	112
Mentor Graphics	137	86
Daisy Systems	135	81
Control Data Corp.	117	88
Applicon	66	53
Auto-Trol	65	52
Valid Logic	56	36
Evans and Sutherland	41	37
Other	670	400
Total	$2.6 Billion	$1.6 Billion

*Excludes computer manufacturers IBM, DEC, DG, PRIME, Hewlett-Packard, etc.
**For industry-specific and cross-industry applications.

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- The increased complexity and integration of systems has slowed the decision-making process. Many users now recognize the importance of design systems to their productivity and their ability to compete.

- However, the integration of new CAD/CAM and CAE products with existing systems is critical to the user. In addition, these systems must also integrate with both planned and existing manufacturing systems and administrative systems. The drive to integrate, or at least to consider integration of multiple functions of the corporation, has pushed the purchase decision to higher levels of management and has caused the formation of purchasing committees, which in turn delays the decision-making process.

- CAD/CAM systems have become capital expenditures; consequently, spending becomes more cyclical.

- There has been a capital spending slowdown in almost all segments of manufacturing, but particularly in electronics companies.

- Customers are now more discriminating and cautious in their spending.

- The use of CAD/CAM/CAE is growing, but unit costs have come down dramatically in the past year so user expenditures will grow at a reduced rate.

- The most rapid growth within the CAD/CAM industry is taking place in the low-end turnkey systems where PC-based systems are proving to be an increasingly popular choice. Thus, although the shipment rate of workstations has increased significantly, user expenditures have not kept pace. The rapid rise of low-cost workstations in this industry has caused a decline in the growth rates from the 18% that was forecast last year, to 15%.

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- Most of the increases in CAD/CAM/CAE will occur in the CAE sector. The total market size for CAE worldwide was $450 in 1985. This segment of the market is forecasted to grow at an average annual growth rate of 25%.

  - The advent of low-cost entry level CAE workstations will expand the market significantly.

  - There is a very low penetration of the overall CAE market; consequently, there is a lot of room for growth.

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III COMPETITIVE DEVELOPMENTS

A. APPLICON

1. PRODUCTS/SERVICES

- Turnkey systems--their primary CAD/CAM products are the Series 4000 and the BRAVO! family of turnkey systems.

2. MARKETS SERVED

- CAD/CAM/CAE for mechanical, electronics, and engineering applications.

3. RECENT ACTIVITIES

- In July 1985, Applicon, a subsidiary of Schlumberger, was merged with Manufacturing Data Systems Inc. (MDSI), also a subsidiary of Schlumberger. They have added Unix versions of their application software to go along with their VAX/VMS offerings.

4. FUTURE DIRECTION

- The very large scale integration (VLSI) product line previously marketed by Applicon is now offered by Electronic Design Automation (EDA). EDA is a new organization reporting to Factron, another division of Schlumberger's Computer-Aided Systems Group.

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B. AUTO-TROL

1. PRODUCTS/SERVICES

- Turnkey systems.

2. MARKETS SERVED

- CAD/CAM systems for the architectural, engineering, and construction (AEC), mechanical design and manufacturing, and technical publications industries. The AEC systems are used to prepare plans for office buildings, residential complexes, and industrial facilities. The plant design software is used to design new plants and to prepare the documentation for plant modifications. The mechanical design software is used to design and document mechanical parts and products.

3. COMPANY STRATEGY

- Their corporate goal is to provide full function, distributed networked workstations with open systems architecture, and the highest quality software applications.

4. RECENT ACTIVITIES

- In April 1985, Auto-trol acquired TRICAD, Inc. of Milpitas, CA. TRICAD marketed DEC VAX-based CAD systems primarily to the AEC market.

- In July 1985, Auto-trol introduced the Advanced Personal Workstation/15 (APW/15), an IBM PC/AT-based graphics system that provides full function capabilities for design, analysis, documentation, drafting, illustration, and support for general engineering programs.

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- In 1985, the company introduced a variety of new packages including an integrated solids modeling system, a progressive die design system, and a kinematics interface package.

- Additional important new products that were introduced in 1985 include new releases of both their Series 5000 and 7000 software with greatly increased functionality and speed, and a host of industry-specific applications and communications supporting an array of protocols and system configurations.

- In fiscal 1985 the company experienced an operating loss and a decline in revenues.

C. COMPUTERVISION

1. PRODUCTS/SERVICES

- Turnkey systems and professional services. The company has developed several integrated lines of CAD/CAM systems marketed under the names CADDStation, CDS 3000, CDS 5000, Designer, Medusa, and Personal Systems. The CDS 4000 and Designer systems represent the largest portion of the company's installed customer base.

2. MARKETS SERVED

- CAD/CAM for mechanical design and drafting, electronic design, architecture, design and engineering, and computer-integrated manufacturing. Their mainstay product is based on their proprietary CDS 4000 minicomputer. The computer runs a library of 400 software programs for design, test, and manufacture.

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- The company has focused its marketing efforts on the following industry groups: automotive, aerospace, architectural, engineering and construction, electronics, and mechanical machinery.

3. COMPANY STRATEGY

- The company is now pioneering the development of product process automation which entails the integration and management of many product data bases to make possible their reutilization throughout the product development cycle.

4. RECENT ACTIVITIES

- During 1985, Computervision was in the process of moving from host-based systems to intelligent standalone networked workstations that will function in an increasingly open architecture. As a consequence of this wrenching transition in its product family, they have exprienced a decline in revenues, a deterioration of their cash position, and a restructuring of the organization.

- In 1985, Computervision introduced a network designed to allow workstations to link up with their minicomputer systems.

5. FUTURE DIRECTION

- The company is in the middle of a three-year product transition period in which it is porting its software from proprietary systems to industry standard platforms. Computervision, once the leader in CAD/CAM, has fallen into third place behind IBM and Intergraph. The company was slow to move its large software library from minicomptuers to workstations.

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D. CONTROL DATA CORPORATION

1. PRODUCTS/SERVICES

- Turnkey systems and remote computing services. They offer extensive CAD/CAM offerings and other engineering and specific applications.

2. MARKETS SERVED

- The Computer-Integrated Manufacturing division provides CAD/CAM/CAE solutions. The Scientific Information Services division, which combines the former CYBERNET and United Information Services divisions, offers remote computing services and software products for engineering and scientific applications. Applications are targeted to the electrical utility, electronic engineering, mechanical engineering, and government markets.

3. COMPANY STRATEGY

- They focus on integrated computer-aided engineering and manufacturing (ICEM). Through turnkey systems based on their Cyber mainframes, they target higher end users. They plan to offer integrated solutions since they view their integration capabilities as their strength.

- The recognition by the market of the importance of data management is a trend that Control Data is well postitioned to capitalize on because of their traditional strength in data management.

4. RECENT ACTIVITIES

- They recently introduced CYBERNET Express, a line of seven software packages for IBM personal computers. The applications available include schematic design and analysis, finite element modeling, piping (for analysis

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and design of piping systems and supports), and power systems (for design and analysis of commercial and industrial electrical distribution systems).

- They have just introduced a configuration management package that tracks the parts involved in the engineering process from design to manufacturing. Their system is unique in that it interacts directly with their CAD/CAM system.

5. FUTURE DIRECTION

- They are moving from engineering applications into combining engineering and manufacturing for an integrated manufacturing approach.

- They have a strong commitment to this market. They are devoting senior management attention and considerable resources to this market.

E. DAISY SYSTEMS

1. PRODUCTS/SERVICES

- Turnkey systems.

2. MARKETS SERVED

- Computer-aided engineering products for the electronics engineering process for design entry, verification, test development, and physical layout functions at the chip and system level.

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3. RECENT ACTIVITIES

- During the second half of 1985, they introduced three significant new products: a PC/AT product, a workstation accelerator known as the Compute Engine, and a software package that facilitates the design of printed circuit boards. Daisy's most significant activities in 1985 were aimed at positioning the company to meet the market's growing demands for a complete CAE environment. Increasingly, the market has sought a building-block approach to the environment issue, offering customers the ability to tailor a CAE environment from a variety of fundamental elements.

4. FUTURE DIRECTION

- The key strategic issue facing Daisy continues to be the transition in products to general purpose computing platforms. The superb gross margins that Daisy has been able to command (75% on average) will decline as personal computer-based systems account for an increasing proportion of Daisy's revenue. Daisy has traditionally received its best gross margins at the high end where its CAE workstations are based on proprietary hardware.

- They have announced plans to begin offering software products on DEC VAX and IBM mainframe computers.

F. IBM

1. PRODUCTS/SERVICES

- Software products sold in combination with computer systems but not as fully integrated turnkey systems.

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2. MARKETS SERVED

- The high-performance CADAM drafting systems and CATIA solid modeling systems have continued to gain market acceptance.

3. COMPANY STRATEGY

- IBM has the advantage that customers want to deal with a stable supplier and IBM is the company they turn to for stability. IBM has focused on factory automation as a key growth area and will focus on the integration of CAD and CAM.

- The company's strategy involves offering a range of workstations such as the PC/AT and the recently announced RT PC in an effort to capture the engineering data base developed by technical professionals. This is part of an overall strategy of linking workstations with host processors and linking engineering data bases with corporate data management, primarily through the DB2 data base management system.

4. RECENT ACTIVITIES

- They have continued to build their CAD/CAM/CAE product line with a steady stream of new products.

5. FUTURE DIRECTION

- They have become the leading vendor of computer systems worldwide for CAD/CAM.

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G. INTERGRAPH

1. PRODUCTS/SERVICES

- Turnkey systems and professional services.

2. MARKETS SERVED

- CAD/CAM systems with an emphasis on graphics systems. They offer DEC-based systems that support the creation, analysis, display, and maintenance of designs, drawings, maps, or other graphic representations. Historically, the company has derived the majority of its revenues from systems for land use and resource management, process and power design, energy exploration, and architectural and engineering design. In recent years, the company has developed systems addressing mechanical design and manufacturing, and electronics publishing.

- Their revenue was derived from companies in the discrete and process manufacturing, petrochemical, geophysical, utilities, architectural, and engineering industry sectors as well as state transportation and federal government agencies.

3. COMPANY STRATEGY

- Their corporate strategy is to provide an integrated, multi-discipline solution to their customer's graphics problems. In addition, they want to provide systems that coexist productively with other functions and processes in their customer's organizations through support of industry standards.

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4. RECENT ACTIVITIES

- Intergraph recently purchased Circuit Tools, Inc., a San Ramon, CA company that designed CSpice, a circuit simulation program and recently introduced a system based on the DEC MicroVAX II. They introduced new products for structural engineering, electronic publishing, and electrical wiring design. They also introduced a CAE system.

5. FUTURE DIRECTION

- They are driving the concept of the distributed processing environment for design applications very aggressively in 1986, with a series of computing system and applications announcements planned through the course of the year.

H. MACNEAL SCHWENDLER CORPORATION

1. PRODUCTS/SERVICES

- They derive 100% of their revenues from leasing MSC/NASTRAN and related software products. MSC/NASTRAN is a descendant of NASTRAN, first released in 1970, a computer program owned by the U.S. government and leased to the public. At the beginning of 1985, MSC/NASTRAN was installed at approximately 25 service bureaus worldwide. Among the service bureaus offering MSC/NASTRAN are Cybernet (Control Data Corporation), Boeing Computer Services, McDonnell Douglas, and A.O. Smith.

2. MARKET SERVED

- MSC/NASTRAN is used as a basic computer engineering tool to analyze structures and determine strength, safety, and performance characteristics.

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- The aerospace industry accounted for a significant amount of MSC's revenue. Other markets they serve include the automotive, shipbuilding, industrial and office equipment, nuclear, petrochemical, and architectural and engineering sectors.

3. COMPANY STRATEGY

- The company leases rather than sells its software which ensures a continuing revenue stream.

4. RECENT ACTIVITIES

- In May 1985, an upgrade called MSC/pal2 was released. MSC/pal2 is a three-dimensional finite element software package for the IBM PC.

5. FUTURE DIRECTION

- MSC believes that microcomputers represent a new market for MSC/NASTRAN. In conjunction with MSC/pal, microcomputers will make available finite element modeling to small- and medium-sized companies with little or no prior experience in finite element technology.

I. MENTOR GRAPHICS

1. PRODUCTS/SERVICES

- Turnkey systems and software products.

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2. MARKETS SERVED

- They offer CAE systems based on their IDEA Series of engineering workstations which are designed to help engineers capture, analyze, verify, layout, test, and document complex logic and circuit designs.

- The company's products are marketed primarily to the aerospace, semiconductor, computer, telecommunications, and consumer electronics industries.

3. COMPANY STRATEGY

- Their strategy has been to focus on companies with large concentrations of engineers. They focus on "key accounts," figuring that 80% of electronics engineers work for the 150 largest companies.

4. RECENT ACTIVITIES

- They have started to sell unbundled CAE software for the PC. In 1985, the company introduced a record number of new products, including the Hardware Modeling Library, the Compute Engine Accelerator, the Board Station workstation for printed circuit board design and layout, the Entry Station product for schematic entry using the IBM PC XT/AT, and QuickParts modeling techniques.

J. TEKTRONIX

1. PRODUCTS/SERVICES

- Turnkey systems and software products. Techtronix entered the CAE market in late 1984 and achieved approximately $20 million in revenue in 1985.

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2. MARKETS SERVED

- Tektronix has products based on each major CAE hardware platform: Apollo Computer Inc.'s Domain Systems, IBM's PC/AT, and Digital Equipment Corporation's MicroVAX line.

3. COMPANY STRATEGY

- Tektronix is attempting an ambitious plan to become the number one vendor in the CAE market, however, the company has run into a number of obstacles and has fallen short of its goals. They are trying to take advantage of their expertise in test and measurement and are emphasizing the link between design and test.

4. RECENT ACTIVITIES

- In March, the company acquired CAE Systems, Sunnyvale, CA, for $75 million. CAE Systems did about $13 million in 1985. CAE Systems has had a number of difficulties in its first year as a Tektronix operation, particularly with product delays and bugs. In August, Tektronix dropped its multimillion-dollar effort to build proprietary engineering workstations in favor of going with industry-standard workstations.

5. FUTURE DIRECTION

- Tektronix will continue to take advantage of its four-decade-old experience in the test equipment world. The major challenge they face is tying together its more than 2,000 instrument-type products into the CAE world. These instrument products include logic analyzers, microprocessor development systems, and semiconductor test systems.

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K. VALID LOGIC

1. PRODUCTS/SERVICES

- Turnkey systems which are integrated into the Valid Integrated Engineering System under the Unix operating system and the Ethernet local area network.

2. MARKETS SERVED

- CAE and CAD. Valid's CAE and CAD products can be used in designing both electronic systems and integrated circuits and include design tools for schematic capture, design verification, test development, and physical layout.

3. COMPANY STRATEGY

- They have focused on extensions to their product strategy in two key respects:

  - Positioning design tools on general purpose computing environments, most immediately the IBM PC/AT and the DEC MicroVAX II systems.

  - The other key thrust at the company continues to be extensions to the Realchip/Realfast line of proprietary hardware used in augmenting design simulation.

4. RECENT ACTIVITIES

- They introduced a variety of new products in 1985, including: Analog Designer, providing CAE to analog engineers; the Motorola 32-bit 68020 CPU was added to their product line; and made some additions to their application specific hardware line.

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5. FUTURE DIRECTION

- They intend to introduce printed circuit board design tools for the MicroVAX II and further extensions to the performance and capacity of the Realchip, Realmodel, and Realfast lines.

- They have been working to improve their sales effort. Their sales staff is roughly half the size of Mentor's or Daisy's.

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IV NEW OPPORTUNITIES

A. CAD/CAM

- There are three major areas of opportunity in the CAD/CAM market: three-dimensional capabilities, integration, and solids modeling.

- Three-dimensional modeling and design represents a significant opportunity. These capabilities are needed in the mechanical, electrical, and chemical fields. Applications include: three-dimensional mechanical design, fluid and air flow, and modeling of molecules in three dimensions.

- The next major opportunity in the market is the emergence of genuine integration of CAD and CAM, and in linkages between CAE and computer-aided testing, developments that promise to compress the process of design, test, and manufacture.

  - Integration is important because it streamlines the product development cycle. A circuit board, for example, evolves from a schematic design into a layout of physical parts and is then rendered as an assembly drawing and transferred to manufacturing. At the same time, the board's mechanical housing must be designed and fitted. With an integrated data base, this activity becomes a single flow of information since all of these functions share a common data base. Thus, engineers at each step can work from the same model, speeding the communica-

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tion of design progress and automatically ensuring part accuracy and compatibility.

- Costly R&D efforts will be required to succeed in developing and bringing such products to market.

- Solid modeling software is an emerging application that is expected to dominate design applications by the end of the decade. In the past, the computing power needed for solid modeling was often prohibitive, but as hardware prices declined and processing power increased, this allowed the capabilities of solid modeling to be available to more engineers. Solid modeling software enables designers to describe the volume and mass of mechanical parts on the computer--a considerable improvement over the edges and corners provided by other kinds of CAD software.

B. CAE

- The opportunities in the CAE market revolve around price, improved data management, and performance.

  - A drawback to CAE systems is price. What is needed are systems in the $10,000-20,000 price range with the same performance and functionality as the systems that average about $50,000. This will bring the systems into a price range that many more engineers can afford. There appears to be a threshold at about $20,000 where large companies begin to think of buying a workstation for every engineer. Currently, engineering workstations are typically shared by a number of engineers.

  - One of the problems associated with CAE systems is the lack of sophisticated data management. Most CAE systems only have limited

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facilities for relating information files. Once a hierarchical DBMS can be integrated into a CAE workstation, the designer will be relieved of much routine work, with a key benefit being the ability to do modular design.

- Another need by chip designers is for faster circuit simulation.

C. OTHER

- The following are emerging research areas that will need software packages:
  - Biochemistry.
  - Combined chemical and structural engineering.
  - Cryogenic and space related research.
  - Graphics for biology.
  - Hydrology.
  - Linkage between automated design and machine tool control.
  - On-line simulation of biological and chemical processes.
  - Parametric design for a family of products.
  - Process synthesis.
  - Strategic Defense Initiative ("Star Wars").
  - Rock stability.

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- In addition, other applications that are needed include:
  - Drilling simulation for underground modeling.
  - Improved laboratory management systems.
- Demand for computerized design and simulation tools will increase in biological and genetic engineering as new technical advances increase the complexity of these fields.

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V CONCLUSIONS AND RECOMMENDATIONS

- Rapid technological advances will continue to characterize the CAD/CAM/CAE industry and competition will continue to be intense.

- Communications are key to creating a productive system whether a customer is trying to share data among its various types of workstations, pass data to a remote location, or tie into a corporate data base.

- The winners in the turnkey market will be those vendors that offer products in the form of an open architecture with independent workstations ranging in power and capability that can all be hooked up to a common data base.

- In the future, current capabilities offered on workstations will be available on PCs. The implications of this are lower prices, greater unit sales, and potentially declining revenues for some vendors. However, the offering of greater capabilities on lower priced systems will serve to overcome a threshold level in the market by opening up the market to new users and new applications.

- To address the needs of the environment, a company should offer a hierarchy of solutions. A vendor should provide an entire spectrum of solutions that all work with a consistent user interface.

- Offering an inexpensive two-dimensional product on a PC will provide the vendor with the opportunity to sell the customer a more expensive three-dimensional product when the customer outgrows two-dimensional.

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- The cost of entry into the market for sophisticated engineering programs such as NASTRAN is substantial and will limit the introduction of new competitive products.

- The CAD/CAM market will eventually develop into a data base battle, giving IBM the advantage over other CAD/CAM vendors. This will occur when the CAD capabilities become a commodity and the data base consequently takes on greater importance.

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APPENDIX ES-A: FORECAST DATA BASE: ENGINEERING AND SCIENTIFIC SECTOR

- This appendix contains the following forecast information, as shown in Exhibit ES-A-1.
  - Market size by delivery mode for each year, 1985-1991.
  - Market growth rates for 1985-1986.
  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.

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EXHIBIT ES-A-1

ENGINEERING AND SCIENTIFIC SECTOR
CROSS-INDUSTRY
USER EXPENDITURE FORECASTS, 1986-1991

DELIVERY MODE	($M) 1985	85-86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	250	5%	263	276	289	304	319	335	5%
APPLICATION SOFTWARE									
MAINFRAME/MINI	150	24%	186	231	286	355	440	545	24%
MICRO	32	31%	42	55	72	94	123	162	31%
TOTAL APPLICATION SOFTWARE	182	25%	228	286	358	449	563	707	25%
TURNKEY SYSTEMS	280	15%	322	370	426	490	563	648	15%
SECTOR TOTAL	712	14%	812	931	1073	1242	1445	1690	16%

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APPENDIX ES-B: FORECAST RECONCILIATION

- This appendix contains the following information:

  - Exhibit ES-B-1 which indicates the changes made in this year's forecast as compared to last year's.

  - An explanation of any changes that were made to the forecasts.

- INPUT has made a significant adjustment in the size of the market for processing services. To avoid double counting, the cross-industry engineering and scientific processing services sold to the discrete manufacturing industry have been largely subtracted out. It was deemed that those revenues had also been counted in discrete manufacturing industry specific processing services. There is considerable overlap between the two sectors and it now is apparent that many applications that were previously classified as cross-industry engineering and scientific are specific to discrete manufacturing.

- INPUT has reduced the forecasted growth rate of the processing services market from 18% to 5%. The engineering community is increasingly bringing their computing work in-house. The increased performance and decreased cost of all computers, but primarily workstations and personal computers, has encouraged the acquisition and use of in-house computers. This process has dramatically cut into the use of outside processing services by engineers.

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ENGINEERING SECTOR - DATA BASE RECONCILIATION OF MARKET FORECAST BY DELIVERY MODE

DELIVERY MODE	1985 MARKET			1991 MARKET			85-90 AAGR FORECAST IN '85 REPORT (%)	86-91 AAGR FORECAST IN '86 REPORT (%)
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPRT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST		
PROCESSING SERVICES	915	250	266%	2490	335	643%	18%	5%
APPLICATION SOFTWARE								
MAINFRAME/MINI	150	150	0%	541	545	-1%	24%	24%
MICRO	32	32	0%	164	162	1%	31%	31%
TOTAL APPLICATION SOFTWARE	182	182	0%	705	707	0%	25%	25%
TURNKEY SYSTEMS	280	280	0%	767	648	18%	18%	15%
CROSS-INDUSTRY SEGMENT TOTAL	1377	712	93%	3962	1690	134%	19%	16%

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Market
Analysis and
Planning
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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
OTHER CROSS-INDUSTRY SECTOR

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U.S. Information Services Cross-Industry Markets, 1986-1991
Other Cross-Industry Sector

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
OTHER CROSS-INDUSTRY SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- The applications included in the other cross-industry sector forecast are:
  - Electronic publishing.
  - Graphics.
  - Sales, marketing, and distribution.
  - Word processing.
  - Miscellaneous.
- Electronic publishing uses computer systems and peripherals to produce high-quality printed materials that can combine text and graphics. Electronic publishing on mainframe and minicomputers is called corporate electronic publishing and on microcomputers is called desktop publishing.
- The graphics segment includes business graphics and presentation graphics as well as mapping.

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- Some of the application areas included in the sales, marketing, and distribution segment are sales and marketing management, sales and marketing productivity, sales forecasting and analysis, direct marketing/response, telemarketing, market research, and distributuion management, accounting, and analysis.

- The miscellaneous segment includes applications such as voice mail, electronic mail, and integrated office systems (e.g., DEC's All-in-One and IBM's PROFS).

B. ELECTRONIC PUBLISHING

- Corporate electronic publishing on mainframes and minicomputers is used primarily by companies that need to generate large volumes of long or complex reports, proposals, technical documents, product documentation, directories, or catalogs. Previously, these companies contracted with commercial typesetters and off-premises printer organizations.

- The desktop publishing market began in early 1985 when Apple Computer, Inc. introduced the LaserWriter, combined it with the Macintosh and special software, and promoted the package as a low-cost way to produce high-quality memos, newsletters, price sheets, labels, and overhead foils. This is also when Aldus Corporation introduced its PageMaker page layout software product.

- There are many benefits derived from electronic publishing, including the following:

  - Improved control over turnaround time. Since projects are done in-house, competition for resources and priority are within the company instead of against a commercial graphics vendor's other customers.

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- Time and cost savings in correcting errors. Errors can be caught and corrected on the screen or from the output.

- A relatively short payback period. Commercial typesetting and graphic design is expensive. Through electronic publishing users can achieve high-quality composition and drafting at a fraction of the cost.

- However, some potential users are hesitant to purchase electronic/desktop publishing systems for the following reasons:

  - Evolving hardware technology. The quality, speed, and resolution of laser printers is constantly improving. Companies in certain industries are waiting for the market to develop before purchasing.

  - Unstable pricing. Due to advancing technology, prices have dropped. Increased competition in hardware, including that from foreign vendors, is heating up. Competition between vendors to increase market share has also contributed to lower prices.

  - Confusion. A large amount of attention has been given to desktop publishing since 1985. The number of vendors offering desktop publishing systems and software has mushroomed in the same period. Potential users need to be educated and assisted in choosing and purchasing the components of a system that will fit their needs.

  - Lack of a PC-compatible solution. Many users are committed to an IBM PC-compatible hardware strategy. It is only very recently that software has been made available in the PC environment.

  - Lack of an IBM directional statement. It was not until March 1987 that IBM expressed its initial plans to incorporate PostScript, thereby showing some direction for its customers.

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- As technology continues to develop, lower investment costs for desktop publishing will result. In May 1987 Ashton-Tate introduced a desktop publishing package that runs on the current installed base of personal computers without requiring additional purchases of mouses, high-resolution monitors, accelerator cards, or graphics cards.

- Another trend is increased use of alternative input devices such as image scanners and optical character recognition (OCR) devices. Several vendors have introduced products to support these input devices, and many other vendors have products in development.

  - Adobe Systems' new product, Illustrator, allows users to work with scanned images to embellish and fill out these images to create complex art.

- With IBM's March 1987 agreement to license Adobe Systems' PostScript page description language, PostScript has become the de facto industry standard.

  - More than 15 vendors in addition to Apple currently ship products using PostScript, and many software vendors have or are developing applications that support PostScript.

  - PostScript's competition includes Imagen's DDL-document description language and Xerox's Interpress.

    - Imagen and Hewlett-Packard, Imagen's customer, were expected to deliver product with DDL in mid-1987. However, H-P decided to use PostScript or a PostScript compatible.

    - Xerox has already shipped product with a reduced functionality (non-editable) version of Interpress, but only for its very high-end laser printer--the Xerox 9700.

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- The basic components of an electronic publishing system are hardware; a CPU or 32-bit workstation; a page description language to bridge the CPU and laser printer; applications software; and input and output devices such as image scanners, optical character recognition (OCR) devices, laser printers, typesetters, and slidemakers.

  - An example of a corporate electronic publishing system is Interleaf's Technical Publishing Software turnkey system which includes a 32-bit workstation, a bit-mapped screen, Technical Publishing Software, a Structured Document Editor, a laser printer, and other peripheral devices.

  - An example of a desktop publishing system includes a Macintosh, MacDraw, MacPaint, MacWrite, Aldus' PageMaker, and a LaserWriter using PostScript.

C. GRAPHICS

- Since the early 1980s there has been a heavy emphasis on graphics. Many current graphics users acquainted themselves with graphics through such integrated packages as Lotus 1-2-3, SuperCalc, or Framework.

  - With the increased awareness of graphics, the proliferation of graphics software products, the improved ease in the use of software, and growing computer literacy, many businesses have increased their use of graphics and brought graphics functions in-house.

  - Although the majority of graphics are used in reports, the use of computer-integrated graphics in presentations is growing rapidly. There is also a migration from monochrome to color graphics and to alternative output mediums including color slides.

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- Some of the leading vendors of microcomputer software have acknowledged the need for improved graphics capabilities by acquiring the rights to graphics software packages or acquiring graphic software companies. Major acquisitions include Decision Resources by Ashton-Tate, Graphic Communications by Lotus Development, and various graphics and graphics-related products by Software Publishing.

- Since personal computers (PCs) were introduced, users have used mainframe applications from their PCs. However, with the introduction of the IBM PC-AT, the migration of mainframe applications to the PC level has increased.

- Some of the major concerns of the use of PC graphic applications include the speed of processing, the quality of output, the difference between the screen image and the final output, and the cost between alternatives.

  - Improved/faster microprocessors including the Intel 80286 (PC-AT) and 80386 (introduced in late 1986) and the Motorola 68000 combined with improved operating speeds of these chips allows for faster graphics processing.

  - Another trend is for graphics processing to be included on the motherboard or graphics card which allows for faster processing.

  - Introduction of high resolution laser printers and graphics plotters allow for high-quality output. As technology advances, high-quality alternate output devices such as slidemakers will become more affordable.

  - Improved graphics cards and color monitors are allowing more colors and higher resolution so that users have a more accurate idea on screen of what output will look like.

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- IBM has introduced Video Graphics Array (VGA) for improved graphics capability. There are concerns that the new standards are not fully compatible with the CGA and EGA standards now in use.

- Many software vendors and users have supported EGA, which has the most momentum behind it to be the de facto industry standard for graphics on PCs.

- Some board and monitor manufacturers are making products that adapt to the user's graphic standard.

- Improved and advancing technology and increased competition as well as high volumes are lowering graphics software prices.

- The mainframe and minicomputer graphics market is affected by some of the same issues and trends as in the microcomputer market.

  - The increasing sophistication of output devices, e.g., laser printers, and the lower prices due to economies of scale and improved cost-effective technology will help persuade more companies to produce graphics internally.

  - Advancing computer technology on mainframe and minicomputers is improving processing speeds and memory capacities while costs are lowering. This makes purchase of these systems more cost-effective than before.

- Graphics vendors are addressing mainframe and workstation combinations that would allow programs to be run locally on workstations and then outputted from any of the graphics output devices that are hooked up to the mainframe.

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- Because of the emphasis on personal computers, some graphics vendors are introducing products that will allow downloading of graphics functions onto PCs.

- With the spreading use of graphics in the corporate environment, vendors are trying to make their systems more user friendly so that business executives can execute their own charts and exhibits with very little training. Some vendors are accomplishing this task by offering menu commands or natural language commands.

- Despite the acquisition of ISSCO by Computer Associates in December 1986 and the discontinued acquisition negotiations between Pansophic and SPSS, the trend toward acquisition of graphics software companies is not seen in the minicomputer and mainframe market.

D. SALES, MARKETING, AND DISTRIBUTION

- Until the late 1970s very few systems were developed specifically for sales and marketing functions. Even now, in those companies whose sales and marketing departments are automated, the majority of sales and marketing managers still use integrated software packages, spreadsheets, data base management systems, and other general decision support systems.

- However, there is a trend toward developing specialized applications software that takes into account the specific needs of the sales and marketing departments.

- The specialized applications of most interest include the following:

  - Marketing data base systems which contain customer and prospect account information and histories. Some of the systems available now

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allow users to show customer ordering patterns, track prospects, integrate purchased or rented mail lists, or accomplish market segmentation using demographics. Some vendors include Adelie, Marketing Information Systems, and Armor Systems.

- Sales analysis and forecasting systems that provide analysis on products by units or dollar volume or on sales by territory, store, or vendor and also take into account seasonality or other cyclical trends. MDS Associates and MCBA, among many other vendors, offer such systems.

- Telemarketing systems which may include script/data prompting, telephone call scheduling, automated dialing for outbound calls and lead source tracking, order entry, and tickler files for follow-up activities. These systems are often connected to a marketing data base system. Some vendors are Arlington Software and Systems, Multi Systems, and International Computerized Telemarketing, Inc.

- Prospect tracking systems that provide basic client information, contact names, latest and planned contact dates, quota and commission rates, call reports, and call analysis. Some vendors are CTek Software, Key Systems, Executive Data Systems, and Excalibur Systems, Inc.

- Management systems that assist sales and marketing managers in the evaluation and planning of marketing programs, sales performance, and product acceptance and in identifying trends and patterns. Two vendors are JEB Systems and GMD Systems International.

- Direct mail systems that process data base information on demographics and sales histories for targeted mailings, merge external lists, purge duplicate listings, and provide on-line updating capabilities. Processing vendors include Metromail, CCX Network, and MAGI, among others. Software vendors offering products include Persoft and Computron Technologies Corporation.

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- In recent years there has been an increase in direct mail marketing. Shopping by mail is becoming more popular as people find less time to shop because of a career, family, or a busy social calendar. In addition to mail order catalogs, many vendors use direct mail as a relatively low-cost medium to direct promotional advertisements to customers in their geographic market area.

- Due to higher postal costs and expensive printing and publishing costs, users of direct mail processing services are demanding list segmentation to more narrowly define their audiences.

  - In addition to list segmentation based on demographics such as age, gender, zip code, etc., there is demand for integration of customer data bases that contain sales histories with the mailing list systems to produce very targeted mailings.

- Another area of interest is in portable personal computers or terminals to increase productivity of field sales and marketing representatives. These systems allow field representatives access to customer sales histories and to enter orders remotely.

  - Although there are products currently available, the market for remote communications cannot reach its potential until hardware technology advances to make portable PCs of lighter weight and less expensive. These units must also be fully functional with sufficient memory and a good screen.

- This segment includes only information services for distribution functions that are not for a specific industry. Distribution applications can also be found in the retail distribution sector, the wholesale distribution sector, and the transportation sector.

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- In many industries, but especially in those where products are fairly homogeneous, vendors compete on service. These services may include expedited delivery on orders, guaranteed in-stock inventory, guaranteed delivery dates, quantity price breaks, or special billing/invoicing terms.

  - Distribution application systems such as distribution center and warehouse management systems, inventory information systems, order entry and processing systems, and billing/invoicing systems allow vendors to deliver on such extra services.

  - Distribution systems provide vendors with information on the best way to get the needed products to the proper place at the right time.

E. WORD PROCESSING

- The word processing market has matured and is approaching saturation. The growth rate of personal computer shipments has slowed, and because microcomputer word processing software shipments are linked to PC shipments, the microcomputer word processing market will also grow at a slower rate.

- The market for word processing will be negatively impacted by the electronic publishing market.

  - Desktop publishing will have a greater impact on word processing than corporate electronic publishing on mainframes or minicomputers.

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F. MISCELLANEOUS

- In the late 1970s and early 1980s the concept of integrated office systems began growing. These systems provide for the integration of such functions as word processing, graphics, spreadsheets, data base management, electronic mail, and other office applications.

- Some of the problems integrated office systems (IOS) vendors are facing include the following:

  - Connectivity between systems to allow file transfer and conversion between hosts, workstations, and applications from one or more vendors. This includes:

    . Technical connectivity that enables one operating system to communicate with another.

    . Application connectivity that will ensure that boldface in a word processing document will still be boldface after the transfer or that data from a spreadsheet will be in the same corresponding cell after the transfer.

  - Integration of office automation applications while providing common user interfaces for easy access to well-developed functions.

  - Support of personal computers including PC versions of vendors' office automation operating systems to distribute office functions onto PCs. Most currently available micro-to-mainframe links do not address office automation integration needs adequately.

  - Connectivity of integrated office automation functions in a multi-vendor environment.

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- Electronic mail capability beyond internal corporate users.

- Some of the more prominent IOS vendors have introduced products that begin to address the above problems.

  - IBM and minicomputer vendors introduced versions of Distributed Office Support Systems (DISOSS) in order to connect DEC, Data General, Wang, and IBM systems. They have announced support for the new peer-to-peer communications link known as LU6.2 or APPC.

    . However, DISOSS still does not provide all the connections needed or desired. In addition, DISOSS and its counterparts from minicomputer vendors are expensive and difficult to install and use.

    . Companies such as Communication Solutions and System Strategies are developing communications software to help the minicomputer vendors.

  - DEC's All-in-One electronic mail system can be linked to IBM's Professional Office System Support (PROFS) electronic mail system using Soft-Switch, Inc.'s products.

- Additional technologies to be incorporated into IOS will include:

  - Voice integration. DEC offers DECTalk which translates E-mail text into voice.

  - Image processing, i.e., scanning input devices.

  - Artificial intelligence.

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- The voice mail market will be heavily impacted by the entrance of the Regional Bell Operating Companies (RBOCs) into the market.

  - RBOCs are still restricted in some of their enhanced service offerings and must wait for the resolution of the Computer Inquiry III that may affect how they will offer voice messaging and storage services.

  - Some local telephone companies, while still regulated by their state public utility commissions, are already entering the market. Their entrance has not had as dramatic an impact on current vendors as the RBOCs' entrance will have.

- As technology advances, voice mail hardware component costs are dropping. Disk storage prices are declining and compression algorithms are improving, allowing for more voice storage per megabyte per dollar.

- New applications that will need to be addressed within the next two years include:

  - Integrated voice and text services.

  - Voice recognition that eliminates manual entry of commands. This is especially useful for applications where both hands are needed for other purposes or for telephone voice inputting of data.

  - Integration of previously disparate office automation applications.

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II MARKET FORECASTS

A. INTRODUCTION

- User expenditures for other cross-industry applications will grow 14% annually through 1991, increasing from $2.8 billion to $5.4 billion in 1991. For details, see Exhibits II-1, II-2, and OC-A-1.

- The mainframe/mini software market will enjoy a rapid growth rate at 25% annually from $385 million in 1986 to $1.2 billion in 1991.

- Microcomputer applications software expenditures will grow at 20%, from $570 million in 1986 to $1.4 billion in 1991.

- Turnkey systems will grow 10% annually, from $1.1 billion in 1986 to $1.8 billion in 1991.

- User expenditures for processing services will grow at a low rate of 8% annually from $683 million in 1986 to $982 million in 1991.

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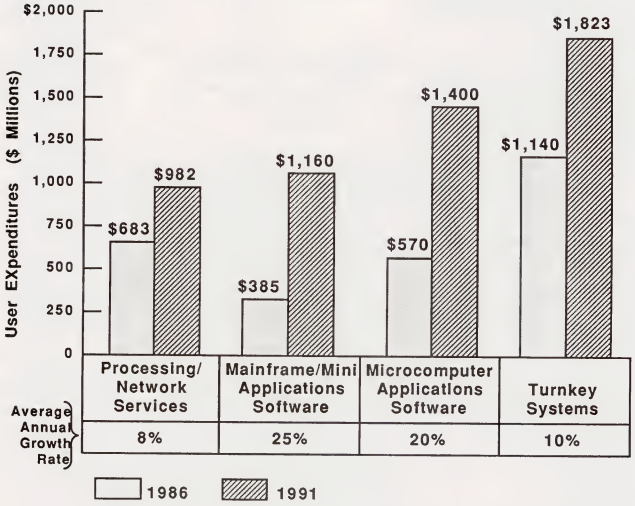
OTHER SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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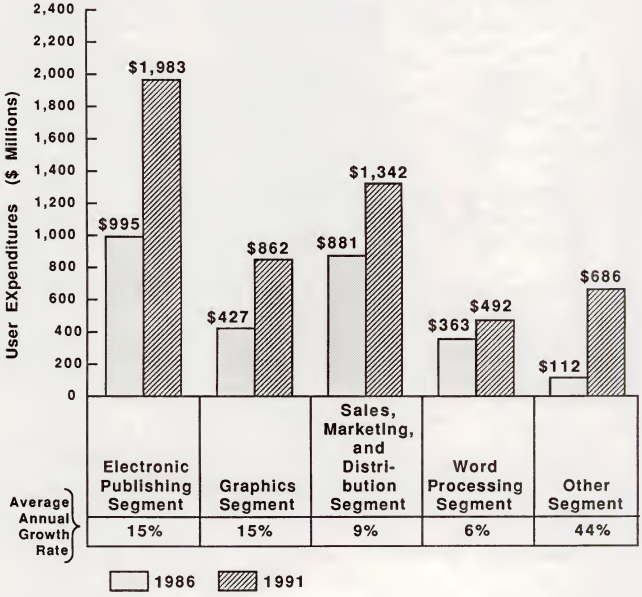
OTHER SECTOR MARKET FORECAST COMPARISON
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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B. PROCESSING/NETWORK SERVICES

- The application with the largest processing volumes in this sector is direct mail/mail list management.
  - Many companies are turning to direct mail as a low-cost method of reaching customers.
  - Direct mail/list management services can range from computer-generated mailing labels or personalized letters to response analysis and fulfillment tracking.
  - As postage costs increase, users are demanding extra services such as list segmentation to reach narrowly defined audiences and mail list merge/purge to avoid duplicated and outdated listings.
- Mainframe graphics processing services are declining primarily because of advancing technology that provides low-cost and high-quality graphic design at the PC level.
  - Graphics processing services will continue its decline as lower cost slidemaking devices become available.

C. SOFTWARE PRODUCTS

- Software will grow at 22% annually. Mainframe and minicomputer software expenditures will grow at a faster rate than those for the microcomputer market.
- Electronic publishing software expenditures are growing at a high rate.

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- In 1985, the majority of desktop publishing software sold was Macintosh-related from Apple. In 1986, software shipments from other vendors began increasing. Apple will continue to lose market share in this market through this forecast period.

- Software for larger systems will grow at a slower rate because the potential market for such systems is much smaller. Only companies that publish large volumes of long or complex documents really need these systems.

- The growth of the desktop publishing market will negatively impact the microcomputer word processing and graphics software markets.

D. TURNKEY SYSTEMS

- The majority of turnkey systems expenditures are in the electronic publishing segment.

  - In determining the size of the turnkey systems market, all peripheral devices purchased simultaneously with the CPU and electronic publishing software are included.

  - For example, an Apple Macintosh, desktop publishing software, and an Apple LaserWriter purchased at the same time as a complete solution is included in the turnkey systems forecast. However, electronic publishing software purchased for a workstation already installed at the customer site is included in the software forecast.

- The electronic publishing turnkey systems forecast is weighted heavily by Macintosh-based systems.

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- As microcomputer software vendors continue to develop and introduce desktop publishing software for the Macintosh as well as for systems by other manufacturers, the desktop publishing turnkey market will grow at a slower rate.

- Mainframe and minicomputer corporate electronic publishing turnkey systems are not expected to be similarly impacted.

E. ELECTRONIC PUBLISHING

- This segment is showing rapid growth primarily because of the novelty of the application. For details, see Exhibit II-3 and OC-A-2.

  - Electronic publishing expenditures will grow 15% annually, from $995 million in 1986 to $2.3 billion in 1991.

  - Microcomputer software will show the most rapid growth at 43% annually, reaching $507 million in 1991 from a base of $86 million in 1986.

  - Mainframe and minicomputer software will grow from $63 million in 1986 to $157 million in 1991, at 20% annually.

  - User expenditures for turnkey systems will increase at a steady 9% annually from $821 million in 1986 to $1.3 billion in 1991.

- The majority of microcomputer products shipped in 1986 were related to Apple products. However, MS-DOS/PC-DOS products are being introduced at a rapid rate. The MS-DOS market is expected to surpass the Macintosh market by the end of 1987.

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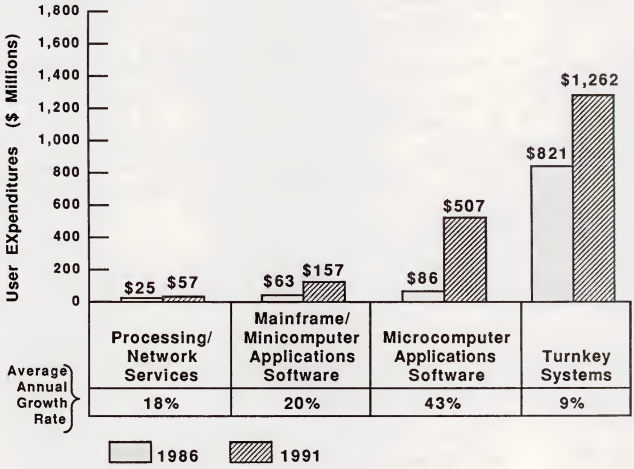
ELECTRONIC PUBLISHING SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Although the number of turnkey systems shipped will grow at a faster rate than 9%, for the following reasons the average price per unit will be lower, resulting in an average annual growth rate of 9% for user expenditures.

  - Competition will increase. As the market continues to grow, more vendors will offer products. Some of the more established vendors will lower prices in order to maintain market share.

  - The prices of laser printers are expected to decrease. Since the laser printer represents from 30% to 60% of the total cost for a desktop publishing system, the impact will be significant.

    . The cost to manufacture laser printers will decrease because of economies of scale and the technological improvements being made in Japan.

- The availability of software that will operate on the installed base of hardware will lower turnkey systems expenditures and increase software expenditures.

F. GRAPHICS

- This segment shows healthy overall growth as the market approaches adolescence, as shown in Exhibits II-4 and OC-A-3.

  - The graphics market will grow at 17% annually, from $221 million in 1986 to $487 million in 1991.

  - Processing services will decline at 2% annually, from $50 million in 1986 to $46 million in 1991.

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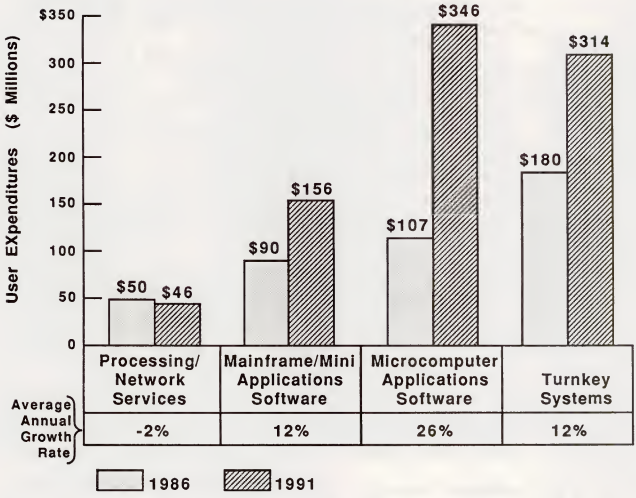
GRAPHICS SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Mainframe and minicomputer software will grow steadily at 12% annually to reach $156 million in 1991 from a base of $90 million in 1986.

- Microcomputer software will grow rapidly at 26% annually, from $107 million in 1986 to $346 million in 1991.

- Turnkey systems will show growth at 12% annually from $180 million in 1986 to $314 million in 1991.

- The increasing quality of hardware in terms of sophistication and speed and the decreasing cost of such hardware play a major role in this segment.

- Processing services are declining because users are able to produce quality graphic designs in-house. High-quality monitors, graphic cards, and printers allow in-house production of graphics with a shorter turnaround time.

- The slow rate of decline in graphics processing is primarily due to growing demand for slidemaking services that stem from higher expectations in general for more impressive and sophisticated presentations.

- The microcomputer software market's growth is in part due to increased use by business managers. As more managers become accustomed to using graphics for financial reporting or sales and marketing applications and presentations, the market will continue to grow.

G. SALES, MARKETING, AND DISTRIBUTION

- This segment will continue to show a slow but steady growth rate through 1990 before the growth rate increases, as shown in Exhibits II-5 and OC-A-4.

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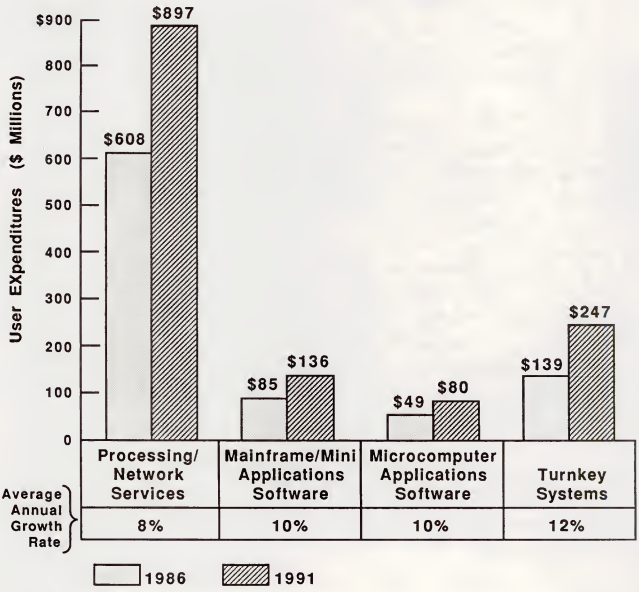
SALES, MARKETING, AND DISTRIBUTION SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Sales marketing and distribution expenditures will grow at 9% annually, from $881 million in 1986 to $1.3 billion in 1991.

- Software will grow at an annual rate of 10% to reach $216 million in 1991 from a base of $134 million in 1986.

- Turnkey systems will grow 12% annually from $139 million in 1986 to $247 million in 1991.

- The sales and marketing market does show potential in the future, but the following reasons dictate its current slow growth:

  - Although many companies are considering or investigating sales and marketing application systems, the selection and evaluation process is very slow and not considered high priority. As a result, purchasing decisions for such systems are often delayed for higher priority projects.

  - There is low motivation to automate sales and marketing functions within most companies. A contrasting example is the insurance industry where insurance companies want to automate their independent agents and brokers. Some of the larger insurance companies provide low-cost financing and other financial incentives on software and turnkey systems to motivate their agents to automate and provide additional productivity.

  - Some decisionmakers are not computer proficient and do not perceive a need to automate. As younger workers who grew up with computers join the sales force, sales and marketing functions will be automated at a faster rate.

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- Because soles ond morketing monogers hove successfully odopted general opplicotions systems such os spreodsheets for soles forecosting, grophics or desktop publishing for proposols ond presentation moteriols, and doto bose monogement systems for client doto boses ond soles trocking, the perceived need for speciolized opplications is low.

H. WORD PROCESSING

- This segment will grow ot o slow rote, primorily becouse of the slowing growth rate of personol computer shipments, os shown in Exhibits II-6 ond OC-A-5.

  - Moinframe ond minicomputer software expenditures will decline 7% onnuolly, from $35 million in 1986 to $25 million in 1991.

  - Microcomputer software will increose 7% onnuolly, from $328 million in 1986 to $467 million in 1991.

- Most microcomputer word processing pockoges will be first-time purchoses, olthough o lorge port of the morket is from upgroding of existing pockoges or switching from one pockage to another.

- Moinfrome and minicomputer word processing expenditures will be impacted by corporate electronic publishing systems os well os continued migrotion of word processing functions to the personol computer level.

- Softwore thot ollows the uplooding of doto from PCs to moinfromes ond minicomputers, especially without having to reformot the doto, is in demand.

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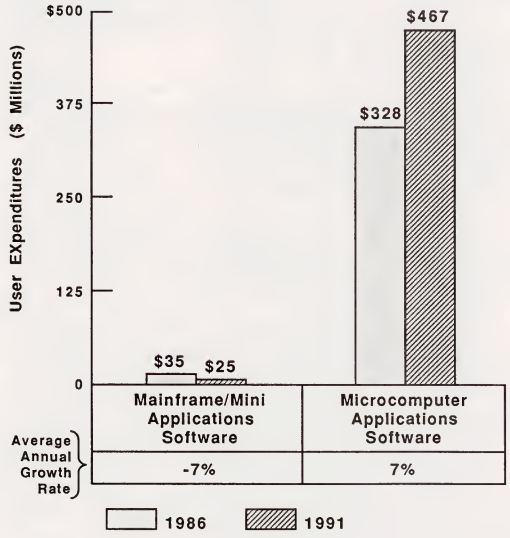
EXHIBIT II-6

WORD PROCESSING SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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I. MISCELLANEOUS

- The forecast for this segment includes the software to support internal voice mail, based on INPUT's estimate of the value of the software sold as part of a system, internal electronic mail software systems, and integrated office software systems. The balance of electronic mail is included in the remote computing services segment.

- Rapid growth in software expenditures due to advancing technology and increasing user acceptance will be partially offset by a move to voice and electronic mail service bureaus, especially after the RBOCs enter the market.

- Until workable solutions for connectivity between PCs, multivendor systems, and other integrated office systems become available, the market for IOS will show slow growth.

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III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The electronic publishing market is characterized by the following:
  - Corporate electronic publishing: a small number of medium-sized vendors and a larger number of small vendors.
    - Leaders in this market include Interleaf, Camex, Texet, Kodak, Xyvision, and Xerox.
  - Desktop publishing: a pyramid consisting of a few large vendors, several medium-sized vendors, and a multitude of small vendors.
    - Leaders in this market include Apple, Adobe Systems, Aldus, Xerox/Ventura Software, and Software Publishing.
- The graphics market is characterized by a few well established vendors and many small vendors.
  - Leaders in the mainframe and minicomputer market include IBM, SAS Institute, ISSCO, Precision Visuals, SPSS, and Hewlett-Packard.

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- Software Publishing acquired Harvard Software in August 1985 and desktop publishing software from T/Maker and Bestinfo in June 1986.

- In December 1986, Pansophic made an offer to acquire SPSS but later decided not to continue negotiations.

B. VENDOR PROFILES

1. ADOBE SYSTEMS INCORPORATED
(1870 Embarcadero Road, Palo Alto, CA 94303)

a. Products/Services

- Adobe designs, develops, and markets systems software used in laser printers, typesetters, and other raster output devices to print integrated text and graphics for electronic printing and publishing applications.

  - The company's principal product, the PostScript interpreter, executes page descriptions generated from application programs that support the PostScript page description language to produce documents containing multiple typefaces and graphics.

  - TranScript, another software product, allows the UNIX-based host composition language, troff (typesetting run off), to drive printers using PostScript.

  - Adobe Illustrator, an application software product introduced in March 1987, is an art production tool for producing high-quality line art and illustrations.

- Adobe also markets PostScript-compatible typeface packages on floppy disks.

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b. Markets Served

- Adobe markets PostScript to computer, printer, and typesetter manufacturers who are original equipment manufacturers (OEMs).

- TranScript and the typefaces are sold to OEMs and end users.

c. Company Strategy

- Since one of Adobe's goals is to promote the PostScript language as an industry standard, Adobe has placed the PostScript language in the public domain.

d. Recent Activities

- In August 1986, Adobe made an initial public offering of 500,000 shares of common stock.

- Fiscal 1986 revenue reached $16 million, a 248% increase over fiscal 1985 revenue of $4.6 million.

e. Future Directions

- Adobe will expand its system software technology into related electronic printing markets and will develop new products for selected end-user markets.

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2. INTERLEAF, INC.
(Ten Canal Park, Cambridge, MA 02141)

a. Products/Services

- Interleaf markets turnkey systems that are based on Interleaf's two software products. Turnkey systems are available in a networked or standalone configuration.

  - Technical Publishing Software (TPS$^{T.M.}$) is designed for use by publication departments or groups that require sophisticated composition and pagination features.

    . A TPS turnkey system includes a 32-bit workstation, a bit-mapped screen, a laser printer, and other peripheral devices. TPS is currently available on workstations manufactured by Sun, IBM, DEC, and Apollo Computer, Inc.

  - Workstation Publishing Software (WPS$^{T.M.}$) is designed for use by workstation users who do not require all the features available on TPS. The typical WPS user has purchased a workstation for some other primary application and acquires WPS as an ancillary documentation tool.

    . WPS is available on 32-bit workstations from most major manufacturers.

- Interleaf also markets its software through original equipment manufacturers (OEMs).

b. Markets Served

- Interleaf markets to two segments of the computer-aided publishing market.

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- TPS is primarily marketed in the technical documentation market to corporations and government agencies. Technical documentation includes designs, drawings, and manuals for commercial products, scientific and engineering reports, and technical bids and proposals.

- Both TPS and WPS are marketed in the office publishing market to manufacturers, banks, insurance companies, investment banking firms, and consulting firms. Office publishing that is enhanced by the integration of graphics and text includes proposals, client reports, brochures, price lists, and memoranda.

c. Company Strategy

- Interleaf follows a strategy of hardware independence, operating on workstations from a variety of manufacturers.

d. Recent Activities

- In June 1986, Interleaf made an initial public offering of three million shares of common stock.

- Fiscal 1987 revenue is estimated at $36 million, an increase over fiscal 1985 revenue of $18.6 million.

e. Future Directions

- Interleaf will continue to develop enhancements and features for its products and to port Interleaf software to additional workstations.

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3. PENTA SYSTEMS INTERNATIONAL, INC.
(309 East Federal Street, Baltimore, MD 21202)

a. Products/Services

- Penta develops, markets, and supports turnkey systems for composition, processing, and electronic pagination of printed materials.

  - Penta's turnkey systems, marketed under the trade name Penta-Modulus, are based on the full line of Data General Eclipse MV hardware and Penta's application software.

  - Penta provides two types of turnkey systems as follows:

    . PentaQuick composition systems automate most of the functions necessary to produce typography.

    . PentaEditorial systems automate most of the functions necessary to edit, analyze, revise, and refine text.

  - Penta offers optional software and hardware and software terminals designed to perform certain specialized text processing tasks for both editorial and composition systems.

    . Text composition products include PentaPage, PentaSaturn, PentaVision, PentaVision+, PentaMath, and PentaPrint.

    . Data base products include PentaBase, PentaSort, PentaLogue, PentaSpell, PentaIndex, and PentaLabel.

    . Telecommunications products include PentaLink, PentaComm, PentaCommpc2, PentaTele/Media, and PentaWord.

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- Networking/distributed processing products include PentaPair, PentaPlus, CEO Interface, and DeltaLink.

b. Markets Served

- Penta sells to two categories of users which include commercial typesetters and businesses with in-house editorial and typesetting requirements.

- Penta also targets vertical markets within each category of users as follows:

  - Commercial typesetting: advertising typesetters, general typographers, and others.

  - General business: manufacturing, insurance, banking/finance, service organizations, printers, and publishers.

c. Company Strategy

- Penta positions its systems as general purpose systems that can be adapted for different uses including commercial typesetting, corporate publishing, technical documentation, and book publishing.

d. Recent Activities

- In May 1986, the trade name PentaModulas was introduced when Penta added a low-end system to encompass the full line of Data General Eclipse MV hardware.

- Revenue in 1986 is estimated at $22 million.

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e. Future Directions

- Penta plans to address the need for software to operate on a variety of computers including personal computers and to develop a better interface for the PC marketplace, using direct interface rather than the translation or conversion systems currently in use.

- Penta also plans to increase and refine its interfaces to output devices, specifically for on-demand printers.

4. DECISION RESOURCES, INC.
(25 Sylvan Road South, Westport, CT 06880)

a. Products/Services

- Decision Resources provides microcomputer graphics applications software products.

  - Decision Resources offers four graphics packages which include CHART-MASTER, SIGN-MASTER, DIAGRAM-MASTER, and MAP-MASTER.

b. Markets Served

- The company markets its software across all industry sectors in the U.S. and internationally through original equipment manufacturers (OEMs) and distributors.

c. Company Strategy

- Decision Resources will continue to develop and regularly improve its product line in order to provide business people with the tools that fulfill their communications needs.

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d. Recent Activities

- Decision Resources was acquired by Ashton-Tate in September 1986.
- Also in September 1986, the company adopted the trade name Master Graphics for its product line.
- In April 1986 Decision Resources began shipping MAP-MASTER.
- Revenue for the 12-month period ending June 30, 1986 was $13 million.

e. Future Directions

- In the near future, Decision Resources plans to introduce products and services that complement and supplement its current line of products.

5. GRAPHIC COMMUNICATIONS, INC.
(200 Fifth Avenue, Waltham, MA 02254)

a. Products/Services

- Graphic Communications, Inc. (GCI) provides microcomputer graphics software products.
- The company offers two packages.
  - Graphwriter creates standard business charts and graphs.
  - Freelance is a freeform graphics package.

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b. Markets Served

- GCI markets its products across all industry sectors.

c. Company Strategy

- The company will continue to promote its products' integration ability between each other, Lotus Development Corporation products, and software from other developers.

d. Recent Activities

- GCI was acquired by Lotus Development Corporation in June 1986. Lotus has introduced Graphwriter and Freelance to its corporate accounts and dealer base.

- Graphic Communications' 1986 revenue is estimated at $9 million.

e. Future Directions

- GCI will continue to concentrate on creating special graphics from spreadsheet data and graphs.

- GCI is also addressing graphics for forms, memos, poster boards, and similar types of visual communication as well as the desktop publishing market.

6. INTEGRATED SOFTWARE SYSTEMS CORPORATION (ISSCO)
(10505 Sorrento Valley Road, San Diego, CA 92121)

a. Products/Services

- ISSCO develops, markets, and supports a family of integrated computer graphics software products for business and scientific applications.

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- ISSCO's software products operate on 32-bit or larger minicomputers or mainframes including Apollo, Control Data, Cray, DEC, Hewlett-Packard, Honeywell, IBM, Perkin-Elmer, Prime, and Unisys.

  . One software product, DISSPLA, has been ported to the 16-bit IBM PC AT.

- ISSCO's family of integrated software, known as IVISS™ (Integrated Visual Information Systems Software), consists of graphics software, system integration software for integrating ISSCO's products with other software and hardware, and applications software for graphic enhancement of other applications. The line of software consists of the following component products:

  . DISSPLA® (Display Integrated Software System and Plotting Language).

  . TELL-A-GRAF®.

  . CUECHART™.

  . THE DATA CONNECTION™.

  . TELLAPLAN®.

  . IVISS MANAGER™.

  . TABLES™.

  . MegaCalc™.

  . DYNAMICS.

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- GKS.
- PINPOINT.
- PC LINK A GRAF.
- CUECHART CHARTBOOK LIBRARY.
- Lotus-to-TELLAGRAF Link.

b. Markets Served

- ISSCO's software products are marketed to large- and medium-size organizations in a variety of industry sectors. The software is used for business or engineering/scientific applications.

c. Company Strategy

- ISSCO plans to incorporate data base software technology in future application products in order to further expand its product line beyond graphics software.

d. Recent Activities

- In June 1986, ISSCO completed its acquisition of a 60% interest in Mimer Information Systems AB, a Swedish developer and marketer of integrated relational data base computer software.
- In December 1986, ISSCO was acquired by Computer Associates International, Inc. for $69.3 million.
- ISSCO's 1986 revenue is estimated at $43 million.

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e. Future Directions

- ISSCO's research and development focus is on mainframe/workstation combinations to allow users to make graphs locally on workstations and then print them out on the graphics output devices that are hooked up to the mainframe.

7. ADELIE CORPORATION
(125 Cambridge Park Drive, Cambridge, MA 02140)

a. Products/Services

- Adelie markets sales and marketing productivity software products and provides consulting and education and training services associated with its software.

- Adelie's primary product is CLOSE, an integrated sales and marketing productivity software system composed of five modules and integrated through the CLOSE marketing data base.

  - The five modules include the Sales System, the Telemarketing System, the Direct Mail System, the Response System, and the Management System.

  - CLOSE operates on IBM 370 and larger computers and the Prime 50 series. CLOSE is also available in a network environment.

b. Markets Served

- Adelie markets its products across all industry sectors. Adelie targets sales and marketing departments within companies that have IBM mainframes, primarily Fortune 1000 companies.

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c. Company Strategy

- Adelie positions itself as the largest company to offer sales and marketing productivity software in the IBM mainframe environment.

d. Recent Activities

- Revenue in 1986 is estimated at $6 million, a 300% increase over 1985 revenue of $1.5 million.

e. Future Directions

- Adelie is developing a version of CLOSE to operate in a distributed processing environment based on IBM mainframes using a UNIX operating system.

8. DISTRIBUTION MANAGEMENT SYSTEMS, INC.
(81 Hartwell Avenue, Lexington, MA 02173)

a. Products/Services

- Distribution Management Systems (DMS) markets applications software packages for warehouse management functions required by medium and large multilocation companies.

- DMS' software products operate on the DEC VAX family of computers (MicroVAX II to 8800) and/or IBM systems (primarily the 4300 and 30XX series).

- The software products are marketed under the name IMPACT. Applications available include the following:

  - IMPACT/Order Management.

  - IMPACT/Warehouse Management.

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- IMPACT/Distribution Center Management.

- IMPACT/Sales Forecasting.

- IMPACT/Distribution Resource Planning.

- IMPACT/Application Expert.

  - OrderEXL™.

  - SalesEXL™.

  - Voice EXL™.

b. Markets Served

- DMS markets its software products to medium and large multilocation companies in various industries, including the automotive aftermarket, pharmaceutical, manufacturing, electronics, utility, chemical, consumer product, and food industries.

c. Company Strategy

- DMS has extended its product line to take advantage of the newest technology--expert systems. By incorporating expert systems technology, DMS positions itself to lead the market in distribution software as the industry matures.

d. Recent Activities

- Fiscal 1986 revenue reached $13 million, a 50% increase over fiscal 1985 revenue of $9 million.

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- In February 1987, Cullinet announced its intention to acquire DMS for approximately $18 million in stock.

9. METROMAIL CORPORATION
(901 West Bond Street, Lincoln, NE 68521)

a. Products/Services

- Metromail provides direct mail list development and enhancement processing services as well as noncomputer services, related mail production, and directory publishing services.

- Metromail maintains a data base of about 78 million U.S. households (more than 90% of total U.S. households).

  - List development services include customized lists and pre-compiled or packaged lists of consumers/households with the common characteristics clients have selected from various criteria categories.

  - List enhancement services include the combining of the client's lists into one list, elimination of duplicates or nonresponders, and correction of addresses and ZIP codes. Items from Metromail's master file, such as telephone numbers, may be added to the client file.

b. Markets Served

- Metromail provides its services primarily to consumer goods manufacturers, magazine publishers, mail order merchandisers, financial service institutions, not-for-profit organizations, and market research firms.

c. Company Strategy

- Metromail will continue selective acquisition of other direct marketing firms.

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- Metromail will add new products and services to appeal to nonseasonal markets in order to increase business in its traditionally lower production periods.

d. Recent Activities

- In January 1985, Metromail acquired Market Development Corporation, a list compilation firm. Its operations have been merged into Metromail's.

- Fiscal 1986 revenue was $86.5 million.

10. WORDPERFECT CORPORATION
(266 West Center Street, Orem, UT 84057)

a. Products/Services

- WordPerfect Corporation provides applications software products for minicomputers and microcomputers.

  - The company's primary product is WordPerfect, a word processing package.

  - Additional products include the following:

    . Student WordPerfect is a student version of WordPerfect.

    . MathPlan is a spreadsheet program.

    . SSIDATA is a data base tool.

    . WordPerfect Library is a collection of programs designed to integrate other WordPerfect Corporation programs and facilitate sharing of data and switching of programs.

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- Features include the shell which is a program manager, a calculator, a file manager, a program editor, a calendar, a notebook, and a macro editor.

b. Markets Served

- WordPerfect markets its products across all industry sector. The company sells to educational institutions and large end-user corporations and through various distribution channels in the U.S. and internationally.

c. Company Strategy

- WordPerfect will continue emphasis on its distribution network. All sales, including those to end-user corporations and educational institutions, are made through dealers and distributors.

- The company also plans to increase emphasis on sales to large corporations.

d. Recent Activities

- WordPerfect rounded out its product line with the introduction of DataBook, a data base management system, in November 1986.

  - The company's WordPerfect word processing system, MathPlan spreadsheet system, and DataBook data base management system can be integrated using WordPerfect Library.

- Revenue in 1986 reached $52.2 milion, a 127% increase over 1985 revenue of $23 million.

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IV NEW OPPORTUNITIES

- Since the electronic publishing market is still in the infancy stage, there are many opportunities for vendors.
  - Barriers to enter this market are not yet unsurmountable since technology in both software and hardware are still evolving and market share for any one particular vendor is still very low.
  - However, vendors may find it difficult to be heard over the noise in this market. Because the market is so new, much attention has been given to electronic publishing, and good sales, marketing, and advertising strategies will play a heavy role in success.
- Freeform graphics is an opportunity for graphics information services. There is a demand for sophisticated systems that allow users to draft art directly on screen.
- An opportunity for vendors specializing in presentation graphics or targeting education and training applications is video graphics systems. This involves combining personal computers, software, video cameras, disk players, and large screen projectors into one system that will merge computer-generated graphics with live or recorded video images.
- In the sales, marketing, and distribution arena, list management processing services that integrate with data base management systems (marketing data base systems) are in demand.

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- The U.S. Postal Service's new national change of address file presents new opportunities for mail list management vendors. The new file will provide these vendors with a major resource to track current customers as well as identify prospects for mailings.

- Telemarketing systems that address the growing interest in telephone sales and marketing is another opportunity.

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APPENDIX OC-A: FORECAST DATA BASE

- This appendix contains the following forecast information, as shown in Exhibits OC-A-1 through OC-A-6.
  - Market size by delivery mode for each year from 1985-1991.
  - Market growth rate for 1985-1991.
  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.

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EXHIBIT OC-A1

OTHER CROSS-INDUSTRY USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	651	5	683	725	778	841	910	982	8
Applications Software									
- Mainframe/Mini	311	24	385	493	627	785	967	1,160	25
- Micro	460	24	570	708	890	1,054	1,213	1,400	20
Total Applications Software	771	24	955	1.201	1,517	1,830	2,180	2,560	22
Turnkey Systems	1,042	9	1,140	1,245	1,347	1,480	1,632	1,823	10
Total	2,464	13	2,778	3,171	3,642	4,160	4,722	5,365	14

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EXHIBIT OC-A2

OTHER CROSS-INDUSTRY SECTOR
ELECTRONIC PUBLISHING

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	20	25	25	30	36	43	50	57	18
Applications Software									
- Mainframe/Mini	50	26	63	82	105	122	139	157	20
- Micro	50	72	86	152	256	334	422	507	43
Total Applications Software	100	49	149	234	361	456	561	664	35
Turnkey Systems	749	10	821	897	968	1,057	1,147	1,262	9
Total	869	14	995	1,161	1,365	1,556	1,758	1,983	15

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EXHIBIT OC-A3

OTHER CROSS-INDUSTRY SECTOR GRAPHICS

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	48	4	50	51	50	49	48	46	-2
Applications Software									
- Mainframe/Mini	80	13	90	102	114	127	141	156	12
- Micro	78	37	107	143	187	239	287	346	26
Total Applications Software	158	25	197	245	301	366	428	502	21
Turnkey System	165	9	180	197	215	240	273	314	12
Total	371	15	427	493	566	655	749	862	15

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EXHIBIT OC-A4

OTHER CROSS-INDUSTRY SECTOR
SALES, MARKETING, AND DISTRIBUTION

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	583	4	608	644	692	749	812	879	8
Applications Software									
- Mainframe/Mini	78	9	85	93	102	112	123	136	10
- Micro	45	9	49	53	58	64	70	80	10
Total Applications Software	123	9	134	146	160	176	193	216	10
Turnkey Systems	128	9	139	151	164	183	212	247	12
Total	834	6	881	941	1,016	1,108	1,217	1,342	9

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EXHIBIT OC-A5

OTHER CROSS-INDUSTRY SECTOR
WORD PROCESSING

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Applications Software									
- Mainframe/Mini	38	-8	35	32	30	28	26	25	-7
- Micro	287	14	328	360	389	417	434	467	7
Total Applications Software	325	12	363	392	419	445	460	492	6
Total	325	12	363	392	419	445	460	492	6

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OTHER CROSS-INDUSTRY SECTOR MISCELLANEOUS

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Applications Software - Mainframe/Mini	65	72	112	184	276	396	538	686	44
Total Applications Software	65	72	112	184	276	396	538	686	44

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APPENDIX OC-B: FORECAST RECONCILIATION

- This appendix contains the following information:
  - Exhibit OC-B-1 indicates the changes made in the 1986 forecast compared to the 1985 forecast.

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EXHIBIT OC-B1

OTHER CROSS-INDUSTRY DATA BASE RECONCILIATION OF MARKET FORECAST BY DELIVERY MODE

DELIVERY MODE	1985 Market			1990 Market			1985-1990 Percent AAGR Forecast In 1985 Report	1986-1991 Percent AAGR Forecast In 1986 Report
	($M) 1985 Forecast	($M) 1986 Report	Variance as Percent of 1986 Report	($M) 1985 Forecast	($M) 1986 Forecast	Variance as Percent of 1986 Forecast		
Processing/Network Services	372	651	-43	710	910	-22	14	8
Application Software								
- Mainframe/Mini	170	311	-45	364	967	-62	16	25
- Micro	386	460	-16	950	1,213	-22	20	20
Total Applications Software	556	771	-28	1,314	2,180	-40	19	22
Turnkey Systems	1,089	1,042	5	2,230	1,632	37	15	10

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About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs.

Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- The applications included in the Planning and Analysis sector forecasts are:
  - Spreadsheets (e.g., Lotus 1-2-3, Supercalc, Excel).
  - Decision support systems (DSS) (e.g., System W).
  - Financial modeling tools.
  - Budgeting and forecasting tools.
  - Project management.
  - All-in-one integrated software (e.g., Symphony and Framework).
  - Operations research.
- Decision support systems (DSS) is a somewhat flexible term that can mean a number of different things. For the purposes of this report, decision support systems include:
  - Spreadsheets, such as Lotus 1-2-3 and Supercalc.
  - Financial modeling and analysis tools.

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- All-in-one integrated software; i.e., Symphony and Framework.

- "Traditional" DSS tools, such as IFPS and System W, that include all or most of the following: data base capabilities, report generator, graphics, query facility, programming language, "what-if" capability, and statistical analysis capability.

- Clarifications to the planning and analysis applications included in this sector's forecasts are as follows:

  - Cross-industry DSS tools are included while industry-specific DSS tools are not, as those are contained in each vertical market sector forecast of user expenditures.

  - Excluded from the analysis and forecasts are analysis systems related to CAD/CAM/CAE.

  - The majority of expert systems and expert system generators are excluded from the forecasts and analysis in this section. The great majority of expert systems will be developed for industry-specific applications or for specific cross-industry applications, such as accounting or human resources, and, as such, are included in each relevant section. In addition, expert system generators are considered to be application development tools and are included in that sector.

  - On-line data bases are not included in either the forecasts or analysis for this sector. Rather, they are forecast in their own section.

- A number of factors are contributing to the health of the Planning and Analysis sector:

  - Technology advances in both hardware and software are enabling previously simple planning/analysis systems to evolve into not only

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decision support systems, but also decision-making systems. Continued advances in artificial intelligence techniques will enable both knowledge-based and expert systems to become increasingly commonplace by the late 1980s.

- The overwhelming success of Lotus 1-2-3 has introduced over two million users to the power of microcomputing, with the attendant market potential for selling add-on products and services.

- User demand for micro-mainframe links has resulted in numerous hardware and software offerings that make it easier to extract data from a central data base and download it to a PC for local analysis.

- For a more in-depth analysis of the market for DSS, please refer to the 1985 INPUT report titled Decision Support Systems: Experience and Outlook.

B. DECISION SUPPORT SYSTEMS

- The marketplace for decision support systems is becoming increasingly crowded.

- Traditional DSS products are for computer users who have outgrown their spreadsheets or need ready access to mainframe data files. Although DSS packages and financial modeling programs have a very solid niche in the Fortune 1000, these sophisticated products will never take over the market because although they may provide greater performance and functionality, the majority of computer users have become very attached to products such as Lotus 1-2-3.

- An area that continues to intrigue vendors, but so far has not developed into a major market, is "executive information systems." This market has been held

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back by the reluctance of executives to embrace computer technology, a situation partially due to the lack of systems that truly address their needs. These needs include:

- Timely access to data from a variety of sources.
- Data manipulation and reporting capabilities.
- Customized graphics.
- Timely distribution of information.
- Convenient and personalized access.
- Pushbutton access to analysis, "what-if," and ad hoc reporting.

- The main trends in traditional DSS include:
  - The merger of DSS and data bases which will provide greater access to information contained in various corporate data bases. This greater integration will allow DSS to become more widely used, as opposed to the relatively isolated usage it has found to date. Traditional DSSs handle importing data from data bases much more easily and capably than spreadsheets.
  - The movement from the mainframe to the PC continues with the most successful products being those well-designed implementations of a mainframe version that allow the PC and mainframe to share data and processing load easily.
  - Mainframe systems are enjoying a resurgence in popularity, spurred by the need to tie in to large data bases, the need for more graphics, and easier-to-use interfaces for mainframe products.

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- The ease-of-use and user interface of DSS products has been improving.

- In the spreadsheet market, a number of new products have been released, but none has successfully challenged Lotus' hegemony in the market. In fact, the sales of 1-2-3 were the highest ever in 1985, with over 500,000 copies sold. The pretenders to the throne include:

  - Low-cost "clones" of 1-2-3, such as VP-Planner from Paperback Software. These work-alikes have had a negligible impact on sales of 1-2-3. Priced in the $100-150 range, they have been beset with bugs, sloppy implementations, and a genuine concern on the part of customers about the financial viability of the companies supplying these products.

  - Microsoft's Excel, developed for the Macintosh. This has been widely touted as the "best" spreadsheet available (with some validity) for any personal computer, including the IBM PC. While it quickly developed into the best selling spreadsheet for the Macintosh (easily leaving Jazz and Crunch in its wake), it still only maintains sales that are a fraction of 1-2-3's.

  - Javelin, which while generating a great deal of excitement for its elegant and innovative design, has failed to generate a commensurate level of sales. As of June 1986, the company had sold "only" 10,000 units totally. This product, which the company describes as a "business analysis and reporting tool," has carved out a strong niche among certain segments of the spreadsheet market, such as financial analysts and other sophisticated users who are involved with developing complex financial models. There is no danger that Javelin will displace Lotus 1-2-3 in the market for general purpose spreadsheets.

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- So-called "three-dimensional" spreadsheets from such vendors as Boeing Computer Services and Martin Marietta Data Systems. These products allow multiple spreadsheets to be linked easily and efficiently. While these products definitely fulfill a need among a number of users in large corporations, such as for consolidating spreadsheets from a number of divisions or product lines, the market they address has been slow to respond.

- While it is inevitable that Lotus will lose some market share, the decline will be gradual at most. In fact, Lotus has a rock-solid hold on the spreadsheet market for at least the remainder of the decade. While the reasons for the success of Lotus have been much discussed, the reasons that Lotus 1-2-3 will maintain the position of being the most entrenched product in the history of microcomputing (with the possible exception of MS-DOS) include:

  - The recently released and upcoming products and services from Lotus that are designed to support the use of 1-2-3. (See the profile on Lotus Development Corporation.)

  - A historically strong management team that has been recently made even stronger and deeper.

  - The support of hundreds of third-party developers who develop useful add-on products for 1-2-3.

  - The reluctance of users to convert to another product, primarily due to the critical mass of Lotus 1-2-3 usage that has been developed in corporations. Users have made very sizeable investments in training, the creation of data files, and the creation of worksheets and templates.

  - Most intriguingly, the introduction of HAL. HAL, a natural language interface for 1-2-3 to be released by Lotus in the fall of 1986, has the

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potential to lock out the majority of competing spreadsheet vendors from the market completely. HAL provides Lotus 1-2-3 with an interface that offers a combination of functionality and ease of use that will remain unmatched by any microcomputer software product for at least the next year.

- For an in-depth discussion of trends in spreadsheets, including a discussion of HAL, please refer to the 1985 report entitled Analysis of Corporate User Needs.

C. PROJECT MANAGEMENT

- Trends that favor the growth of project management systems include:

  - A broadening awareness of project management techniques brought about by the recent availability of micro-based project management software.

  - Relatively low penetration of project management systems in some key user industries.

  - Project management techniques that are beginning to spread to organizations which have not historically been managed under a project-oriented structure and that are being applied to smaller scale projects. This widening of applications can be attributed to the availability of powerful micro-based project management software.

  - A few years after the first limited-function microcomputer project management packages were introduced, more sophisticated, higher-cost microcomputer packages were introduced by vendors such as Primavera and Strategic Software Planning Corporation. These higher

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performance microcomputer packages have attracted many users away from mainframe and minicomputer solutions.

- One of the biggest problems with using micro-based project management has been the inability to get data from applications such as dBase III and Lotus 1-2-3. Consequently, a number of microcomputer software project management vendors are providing a direct interface with these applications. Examples of programs that have recently added this capability include Timeline, Primavera, and the Harvard Total Project Manager.

- Trends that will slow the growth of the market include:

  - One of the problems in selling project management is that it requires a face-to-face selling effort to sell the package effectively.

  - There are few new applications that have large projects to make up for the growing saturation in the aerospace/defense and other large-project markets.

  - The need to educate customers on project management techniques.

  - Long selling cycles--six to eight months for large systems; several months for micro-based systems.

- A more detailed analysis of the project management market can be found in the 1985 INPUT report titled Market Analysis: Project Management Systems.

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II MARKET FORECASTS

A. INTRODUCTION

- User expenditures for cross-industry planning and analysis applications will grow at a moderate 10% average annual growth rate through 1991, increasing from $1.9 billion in 1986 to $3.17 billion in 1991, as shown in Exhibit II-1.

- Forecasts for user expenditures by delivery mode are shown in Exhibit II-2.

- Appendix PA-A contains the forecast data base for each year from 1985 through 1991 by delivery mode.

- Exhibit II-3 lists the revenues of major vendors in the Planning and Analysis sector.

- Positive factors impacting this market include:

  - More powerful microcomputer hardware.

  - Improved micro-mainframe links for easier access to large data bases and for faster dissemination of results.

  - Improved integration of planning and analysis systems with transaction processing systems.

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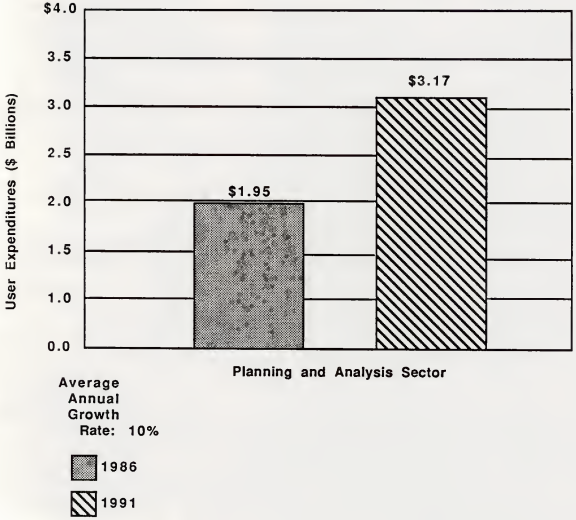
EXHIBIT II-1

PLANNING AND ANALYSIS SECTOR
INFORMATION SERVICES MARKETS, 1986-1991



MSPA/PA

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EXHIBIT II-2

PLANNING AND ANALYSIS SECTOR
INFORMATION SERVICES MARKETS BY DELIVERY MODE, 1986-1991

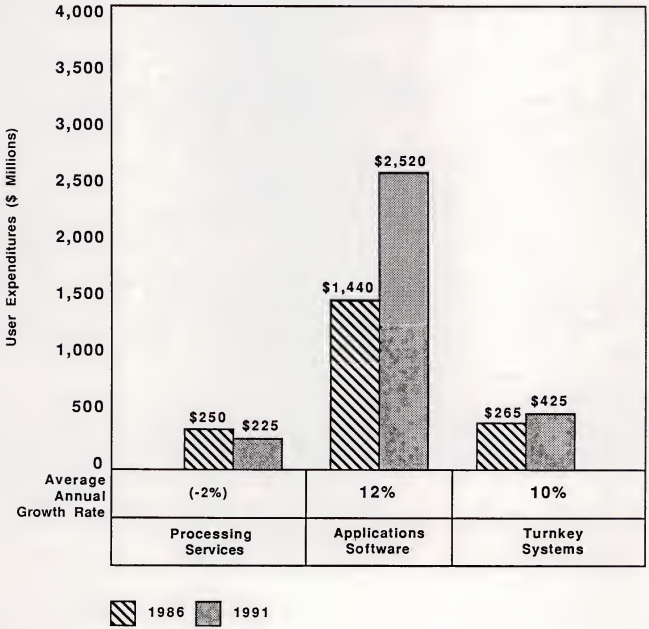

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EXHIBIT II-3

PLANNING AND ANALYSIS SECTOR
REVENUES OF LEADING INFORMATION SERVICES VENDORS, 1985

VENDOR NAME	PRIMARY MARKET/ APPLICATION	U.S. 1985 REVENUES ($ Millions) PROCESSING AND NETWORK SERVICES	APPLICATIONS SOFTWARE	TURNKEY SYSTEMS	TOTAL
Lotus Development Corp.	Spreadsheets	-	$197	-	$197
Metier	Project Mgt.	-	10	$30	40
Comshare	DSS	$20	12	-	32
Microsoft	Spreadsheets	-	25	-	25
IBM	DSS	$10	15	-	25
Execucom	DSS	-	20	-	20
PSDI	Project Mgt.	-	16	$4	20
Computer Associates	Project Mgt.	-	18	-	18
AGS Management Systems	Spreadsheets, Project Mgt.	-	14	-	14
Ashton-Tate	Integrated SW	-	13	-	13
Management Decision Systems	DSS	-	11	-	11
Software Publishing Corp.	Project Mgt.	-	6	-	6
Total		$30	$357	$34	$421

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- Negative factors influencing this market are:

  - Users are unwilling to learn new systems if their current system is believed to be adequate.

  - The increased "verticalization" of most general purpose planning and analysis applications, such as DSS and project management, while certainly a positive trend for vendors, has a negative implication for INPUT's cross-industry planning and analysis forecasts. The move to industry-specific applications means that the growth areas in the market will not appear in the forecasts for planning and analysis; rather, they will be shifted to the appropriate vertical market.

B. PROCESSING SERVICES

- The proliferation of fully featured, competitively priced, PC-based DSS packages has had a dramatic impact on remote computing services. PC-based DSSs have provided a ready alternative to remote computing services for small firms or new users just entering the market for a DSS. It's easier than ever before for a small- to medium-sized company to buy a small decision support system.

- Processing service vendors are moving increasingly to provide on-line data base services in conjunction with their DSS services. Note: The growth in the market for on-line data bases is part of a separate forecast and is not included in the Planning and Analysis RCS market forecast.

- About 10 remote processing service companies offer project management services, but most have de-emphasized this service in the wake of declining sales.

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C. SPREADSHEETS

- The factors contributing to the growth of user expenditures for spreadsheets include:
  - New users who will be attracted by the HAL natural language interface.
  - Templates, add-ons, custom consulting services, and other services for 1-2-3 that will extend its life.
  - The ability of "clone" vendors to sell to users who desire their own copy of a spreadsheet rather than being forced to "share" a copy of 1-2-3.
  - Micro-mainframe links that increase the usefulness of PC-based spreadsheets.
- The factors that negatively impact user expenditures for spreadsheets include:
  - Saturation in the market.
  - Downward pricing pressures from low-priced clones (however, the "street" price of Lotus 1-2-3 has actually gone up $20-30 in the past year due to Lotus imposing order on its distribution channels).
  - Site licensing plans which lower the per-unit price of software (however, there may be a corresponding increase in volume to compensate. In addition, Lotus has successfully resisted site licensing).
  - Increased sales of all-in-one integrated software which reduces the need to buy a separate spreadsheet.

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- Consequently, the net result will be flat sales for spreadsheets in the U.S. with the only growth coming from overseas markets. However, related add-on products and services for spreadsheets (primarily Lotus 1-2-3) offered by either Lotus or other firms will continue to show strong growth.

D. DECISION SUPPORT SYSTEMS

- The main factor spurring growth of traditional DSS software is the increased development of connected computing systems in the form of micro-mainframe links, LANs, and distributed processing networks. Greater access to data will drive greater demands for tools to analyze the data.

- Other factors postitively impacting the market for traditional decision support systems include:

  - Artificial intelligence technologies to improve the power and ease of use, and consequently the attractiveness, of current DSS applications. Most of the current product development in DSS with respect to artificial intelligence is taking place in the user interface area with natural language interfaces, particularly in ad hoc data retrieval applications.

  - Improved networking and micro-mainframe communications, which will stimulate the growth to larger scale, organization-wide DSS applications.

- The main factor slowing growth of traditional DSS software is that users are reluctant to learn new systems.

- Other factors negatively impacting the market for traditional decision support systems include:

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- Because of constantly improving price/performance of all ranges of hardware and increased power of applications software, remote computing services and batch processing will continue to lose ground to in-house solutions. However, market opportunities still exist for the processing of very large data bases with their attendant retrieval and analysis requirements.

- The market is becoming mature.

E. PROJECT MANAGEMENT

- The aerospace and defense industries have been behind much of the brisk growth of project management turnkey systems growth. However, this market is reaching saturation. Areas where there is still room for growth include contract construction, high technology manufacturing, and management of R&D labs. These untapped opportunities exist because micro-based project management systems make the use of project management techniques in smaller projects more feasible.

- The growth in traditional turnkey systems, as well as mainframe and minicomputer software, has slowed while growth in micro-based project management continues to grow rapidly.

- U.S. sales of project management software for mainframe and minicomputers in 1985 were $95 million. The forecasted growth rate over the next five years will be between 12-15% as new high-end applications somewhat offset the impact of micro-based products.

- User expenditures of micro-based project management software were $28 million in 1985. The five-year growth forecast is 24%.

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III COMPETITIVE DEVELOPMENTS

A. VENDOR PROFILES

1. AGS MANAGEMENT SYSTEMS

a. Products/Services

- The company designs and markets project management and system development products for monitoring the planning and control of complex projects. These products provide simulation, scheduling, resource allocation, network evaluation, and target scheduling. AGS Management Systems is a subsidiary of AGS Computers, Inc. The comprehensive product line of AGS Management includes the following project management packages;

  - PAC I: A network scheduler and cost control system designed for scheduling single projects.

  - PAC II: A resource scheduling and cost processing system.

  - PAC III: A more sophisticated scheduler and cost control system. The product was designed for larger engineering and construction projects.

  - PAC EV: A performance measurement system that assists in performing detailed cost analysis and performance trend analysis on projects.

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- PAC MICRO: A microcomputer-based critical path scheduler.

b. Company Strategy

- The company leverages the expertise of AGS Computers in custom programming to provide extensive support services, including integrated installation planning, product specific and skills development training, and consulting.

2. ASHTON-TATE

a. Products/Services

- The company's primary products are dBase II and III, the leading data base management programs for microcomputers. The company's product for the Planning and Analysis sector is Framework, an all-in-one integrated software product for IBM PCs and compatibles that includes word processing, spreadsheet, data base management, business graphics, and telecommunications.

b. Company Strategy

- AGS Management Systems is emphasizing sales and support to large corporations.

c. Recent Activities

- In September 1985, Framework II was released, containing a larger, faster, more powerful spreadsheet, an improved word processor, and more tightly integrated telecommunications. In addition, the company introduced an add-on financial modeling package which is the third package in the Decision Maker series for Framework II, the other two being Project Analysis and Decision Modeling modules.

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- The company signed a marketing pact with Javelin, the developer of an innovative financial modeling tool, giving Ashton-Tate exclusive international marketing rights for the product. Ashton-Tate plans to take advantage of its strong presence overseas in software marketing.

d. Future Direction

- Under the direction of president Ed Esber, the company plans to transform itself from a microcomputer software company to a computer products and services company. It will do this by offering consulting services, micro-mainframe links, training services, and minicomputer and mainframe versions of its products.

3. COMPUTER ASSOCIATES

a. Products/Services

- Computer Associates designs, develops, markets, and supports systems software, data base management, and applications software products for mainframes, minicomputers, and microcomputers. Its Planning and Analysis sector products include:

  - CA-Financial Planner, a financial forecasting and modeling system for IBM mainframe computers.

  - Supercalc 4.0, an integrated spreadsheet for MS-DOS-based micro-computers, which includes spreadsheets, graphics, and data management.

  - Superproject Plus, a project management package for MS-DOS-based microcomputers.

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b. Company Strategy

- CA is expected to concentrate on niche applications with high profit margins while trying to maximize its advantage in the micro-mainframe link area.

- The company will continue to concentrate on sales to Fortune 1000 corporations.

c. Recent Activities

- Computer Associates Micro Products Division introduced two updates in 1985 for its microcomputer software line--Supercalc 4.0 and Superproject Plus.

  - Supercalc 4.0 added improved macro capabilities and expanded data file exchange capability, including the ability to read and write Lotus 1-2-3 files.

  - Superproject Plus, announced in 1985 and shipped in January 1986, added the following capabilities: the ability to handle the scheduling and allocation of resources, resource leveling, the maintenance of planned versus actual schedules and costs incurred, and the ability to review multiple projects.

- In January 1986, the company announced the release of CA-Financial Planner/PC, a PC-based counterpart for CA-Financial Planner. CA-Financial Planner/PC will give organizations the capability of distributing the process of financial modeling and report development to individual users of microcomputers.

- CA introduced a very aggressive site licensing program that offers customers great flexibility in pricing and delivery as well as better control over the distribution of micro software. In conjunction with its Corporate License Program, it signed a site license agreement with GE, a company with over

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20,000 microcomputers. The agreement gives GE the right to make an unlimited number of copies of Supercalc for an undisclosed sum.

d. Future Direction

- It is likely that CA will de-emphasize new applications software development for microcomputers and instead focus more on product enhancements.

4. COMSHARE

a. Products/Services

- Comshare is a leading vendor of IBM-based decision support and business modeling software and services. It offers software for mainframes, minis, and microcomputers as well as remote computing services. The DSS products offered include:

  - System W, a decision support system used for financial and strategic planning to investigate, analyze, model, forecast, and graphically display information residing on a corporate data base.

  - Micro W, the microcomputer version of System W.

  - Commander EIS, an executive information system.

b. Company Strategy

- Comshare continues to focus on distributed decision support systems, which allow users to harness the power of both microcomputers and mainframes.

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c. Recent Activities

- In September 1985, Comshare announced an OEM agreement with Electronic Data Systems Corporation (EDS). The agreement provides EDS with a license to Comshare's entire product line of System W decision support software for end-user computing. EDS will use System W for internal EDS needs as well as for customers for whom System W is the appropriate answer to applications needs.

- In January 1986, Comshare announced a version of System W called Personal W for the IBM RT. The product offers three-dimensional analyses and consolidations, enabling easy manipulation of multiple spreadsheets.

- In September 1985, the company introduced Commander EIS, an executive information system software product line for mainframes and microcomputers. The product offers easier access to information contained in mainframe data bases.

d. Future Direction

- The company continues to make the transition from remote computing services into a full service decision support software and services company. It is concentrating on becoming a leading supplier of software and services for DSS and placing less emphasis on its other product lines.

5. EXECUCOM

a. Products/Services

- Execucom designs, manufacturers, and markets DSS software for nontechnical business professionals. Its primary product is IFPS (Interactive Financial Planning System), designed to run on mainframe computers. IFPS is a financial modeling and business planning system that allows the user to do "what-

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if" analysis, optimization, sensitivity analysis, report writing, consolidations, and trend analysis. IFPS is the most popular financial modeling tool in business use today.

b. Company Strategy

- The company strategy is to:
  - Maintain its leadership position by continuing to enhance IFPS.
  - Leverage its current technology for other markets; e.g., Mindsight for the Macintosh.
  - Acquire related technology to move into new markets; i.e., PC to mini to mainframe connections.

c. Recent Activities

- In March 1986, Execucom was acquired by Travelers/Diebold Technology Company, a venture of the Travelers Corporation (insurance) and John Diebold who heads the Diebold Group, a management consulting firm.
- In July 1985, the company released several new products, of which the most important in the Planning and Analysis sector are:
  - IFPS/Plus, which is essentially an enhanced version of IFPS. The new release includes greater integration features and distributed processing capabilities between mainframes, minis, and micros. The package also includes a micro-mainframe link to IFPS/Personal, Execucom's micro-based DSS product.
  - Corporate Decision Support System, which is a mainframe- and minicomputer-based product features data modeling, micro-mainframe networking, data transfer, optimization, and presentation graphics.

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- Mindsight, which is a business planning software package designed to take advantage of the Macintosh's user interface. The program features many of the same capabilities as IFPS/Personal.

6. LOTUS DEVELOPMENT CORPORATION

a. Products/Services

- The Planning and Analysis software packages that Lotus provides include:

  - Lotus 1-2-3, an integrated spreadsheet.

  - Symphony, an all-in-one integrated software package.

  - Jazz, an all-in-one integrated software package for the Macintosh.

- The key revenue-producing products for Lotus are Lotus 1-2-3 and Symphony.

b. Company Strategy

- Lotus' product strategy for the near term is to build around 1-2-3 by offering value-adding upgrades, enhancements, companion products, and product extensions rather than introducing completely different applications. Lotus will wait for the next generation of hardware to be established before departing from this strategy and attacking completely new markets.

c. Recent Activities

- Lotus has been extremely active over the past year in releasing new products and acquiring new companies and products, acquiring a total of five companies. The most significant developments over the past year that relate to the Planning and Analysis sector include:

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- In May 1985, Jazz was introduced.

- In September 1985, 1-2-3 Release 2 was released. The update added a larger worksheet, improved memory management, a new macro command language, and several other improvements.

- In May 1986, Lotus acquired Graphic Communications, Inc., a presentations graphics vendor.

- In February 1986, Lotus acquired GNP Development Corporation, the developer of HAL.

d. Future Direction

- The products that will likely be introduced in 1986 include:

  - HAL.

  - Engineering and scientific word processor.

  - Financial planning extensions to 1-2-3.

  - Engineering and scientific extensions to 1-2-3.

  - Added functionality for Signal, the stock quote transmission service.

- Products that are currently under development that may be released in the 1987-1988 timeframe include:

  - Free-form data base/idea processor.

  - Group productivity tool.

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- Messaging/electronic mail product.

- Business word processor.

- Data base management system.

- New generation spreadsheet with a graphical interface.

7. MANAGEMENT DECISION SYSTEMS

a. Products/Services

- Management Decision Systems is a leader in the design and implementation of decision support systems. Its primary product is Express, an integrated decision support system noted for its powerful relational data base.

b. Company Strategy

- The company will continue to strive to provide the most complete range of decision support services, including research, consulting, and software.

c. Recent Activities

- Information Resources, Inc. (IRI) acquired MDS in April 1985. Information Resources is a marketing information company noted for its use of UPC scanners to track in detail the buying characteristics of approximately 35,000 households.

- In June of 1985, the company released PCexpress, a decision support system for the IBM PC and compatibles. The program is designed for applications in marketing and finance and combines data base management, query, modeling, statistical reporting, and graphics capabilities.

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- In February of 1985, the company released two financial software packages built on the firm's Express decision support system: Express Easyscan and the Financial Consolidation and Reporting System (FCRS). Express Easyscan allows a user to analyze Standard and Poor's Compustat II data bases of corporate financial data. FCRS is a menu-driven, interactive system for the consolidation and reporting of general-ledger data such as that from multiple divisions from a large corporation.

d. Future Direction

- Express will continue to be the major software product sold by IRI/MDS. The company will continue to develop marketing applications with Express, but with a special emphasis on products that use IRI data. The financial application products will receive lesser priority. The biggest change after the acquisition will be to focus on development of special application products that utilize IRI consumer data.

8. MICROSOFT

a. Products/Services

- Microsoft designs, develops, markets, and supports over 40 different microcomputer software products, a complete line of operating systems, applications for business and professional markets, and microcomputer programming languages. Its Planning and Analysis sector applications include three software packages: Microsoft Project, Multiplan, and Excel.

  - Multiplan, with versions for both MS-DOS computers and the Macintosh, has an installed base of one million units as of the end of 1985.

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- Excel, introduced in October 1985, is a spreadsheet integrated with data base and business graphics modules for use on the Apple Macintosh computer. Excel is now both the highest regarded and best-selling spreadsheet for the Macintosh.

- Microsoft Project is a critical path method (CPM) project scheduling and resource allocation program designed for use on MS-DOS-based computers. Microsoft introduced this product in April 1984 for the IBM PC and enhanced it in December 1985 to include PERT charting and computer-based training among other new features.

b. Company Strategy

- Microsoft will focus on developing for the IBM market and will curtail new applications development for the Macintosh. The company feels that as the leading seller of software for the Macintosh it is sufficiently represented in that market. Microsoft has shunned the all-in-one product direction in favor of single applications products. The foundation of the company's product strategy is the belief that users are primarily task-oriented and prefer the in-depth capability of that application package. Microsoft will provide integration of its standalone packages through Microsoft Window, a graphical operating environment which runs on MS-DOS computers.

c. Recent Activities

- Microsoft went public in the first quarter of 1986. Its stock offering was received very favorably.

d. Future Direction

- Microsoft plans to release a version of Excel for the IBM PC, designed to run under its Windows operating environment. With this product, the company hopes to be one of the first software vendors to release a product that takes

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advantage of the greater processing power of the 80286-based PC-AT. It is also working on adapting its other application products to run under Windows.

9. PROJECT SOFTWARE DEVELOPMENT, INC.

a. Products/Services

- Project Software and Development, Inc. (PSDI) develops and markets project management software and related services. The company offers project management solutions for mainframe, mini, and microcomputers. Its products include:

  - Project/2 for mainframes and minis is a software system which integrates project planning, scheduling, and cost control functions with graphics and relational data base capabilities. This package is offered in turnkey configurations and as a remote computing service.

  - QWIKNET is a project management software package for personal computers that allows management of schedules, costs, and resources.

  - Personal PROJECT/2 is a turnkey project management system for the IBM PC/370.

b. Company Strategy

- PSDI is dedicated to developing the highest quality, full-functionality project management software whether for mainframes or personal computers. It is the largest independent project management software company, with revenues of approximately $25 million in 1985.

c. Recent Activities

- Personal PROJECT/2 was released in July 1985.

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10. SOFTWARE PUBLISHING CORPORATION

a. Products/Services

- The products that Software Publishing offers in the Planning and Analysis sector are:

  - pfs: Plan, an easy-to-use spreadsheet product which sold approximately 75,000 units in 1985.

  - Harvard Total Project Manager, a micro-based project management system which sold approximately 11,000 units in 1985.

b. Company Strategy

- Software Publishing is presently undergoing a major transition from a company that caters exclusively to the low end of the micro software marketplace to a company that develops and markets higher performance software to more sophisticated users in large corporations. As the key thrust to this strategy, the company plans to introduce in August 1986 a host of new products and enhancements to current products under the Harvard product family. This will be a higher-end product line which will offer greater performance and functionality as compared to the pfs: product family.

c. Recent Activities

- In the second quarter of calendar 1986, Software Publishing reported a quarterly loss. The company attributes its recent decline in performance to two important changes in the market: a shift in the retail channel toward corporate selling and a shift in end-user demand toward high performance software.

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d. Future Direction

- Software Publishing intends to continue dominating the low end of the market comprised of first-time users and small businesses. In addition, with the Harvard product family, it plans to increase its penetration among more sophisticated users and large corporate customers. However, the higher-end Harvard line will be slow to develop momentum in the market, primarily because of the longer selling cycles involved with higher-end software.

- The company is presently increasing its outside sales force to better serve the corporate market; however, all sales leads are still referred to a dealer.

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APPENDIX PA-A: FORECAST DATA BASE: PLANNING AND ANALYSIS SECTOR

- This appendix contains the following forecast information, as shown in Exhibit PA-A-1.
  - Market size by delivery mode for each year from 1985 through 1991.
  - Market growth rates for 1985-1986.
  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.

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CROSS-INDUSTRY SERVICES MARKET
PLANNING AND ANALYSIS SEGMENT
USER EXPENDITURE FORECASTS, 1986-1991

SEGMENTATION BY DELIVERY MODE	($M) 1985	85/86 GROWTH	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	AAGR 86-91
PROCESSING SERVICES	250	0	250	246	241	237	231	225	-2
APPLICATIONS SOFTWARE									
MAINFRAME/MINI	603	10	663	710	785	864	961	1076	10
MICRO	686	13	775	890	992	1104	1276	1445	13
TOTAL APPLICATIONS SOFTWARE	1289	12	1438	1600	1777	1968	2237	2521	12
TURNKEY SYSTEMS	242	10	266	297	346	374	401	425	10
SECTOR TOTAL	1781	10	1954	2143	2364	2579	2869	3171	10

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APPENDIX PA-B: FORECAST RECONCILIATION

- This appendix contains the following information:
  - Exhibit PA-B-1 which indicates the changes made in this year's forecast as compared to last year's.
  - An explanation of any changes that were made to the forecasts.
- The remote computing services and batch processing market size and growth rates has been reduced significantly for the following reasons:
  - The largest part of the market for cross-industry remote computing services for DSS applications are on-line data bases, and these services are forecast separately and are not included in the Planning and Analysis forecasts.
  - As the cross-industry Planning and Analysis applications become increasingly oriented to industry-specialized applications, those user expenditures are included in the appropriate vertical sector and not in Planning and Analysis.
  - A saturation in the market for DSS products in the U.S. Much of the current and future growth is anticipated to come from overseas markets that are not included in the forecasts.

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PLANNING AND ANALYSIS SECTOR
DATA BASE RECONCILIATION OF MARKET FORECAST
CROSS-INDUSTRY, BY DELIVERY MODE

DELIVERY MODE	1985 MARKET			1991 MARKET			85-90 AAGR	86-91 AAGR
	1985 FORECAST ($M)	1986 REPORT ($M)	VARIANCE AS % OF '86 RPRT	1985 FORECAST ($M)	1986 FORECAST ($M)	VARIANCE AS % OF '86 FCST	FORECAST IN '85 REPORT (%)	FORECAST IN '86 REPORT (%)
PROCESSING SERVICES	829	250	232%	1854	225	724%	14%	-2%
APPLICATIONS SOFTWARE								
MAINFRAME/MINI	603	603	0%	1931	1076	79%	21%	10%
MICRO	686	686	0%	1452	1445	1%	14%	13%
TOTAL APPLICATIONS SOFTWARE	1289	1289	0%	3384	2521	34%	18%	12%
TURNKEY SYSTEMS	242	242	0%	722	425	70%	20%	10%
SECTOR TOTAL	2360	1781	33%	5960	3171	88%	17%	13%

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- The negative factors cited in the market forecast section.

- The forecasts for turnkey systems were reduced for the reasons cited in the market forecast section.

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
PROFESSIONAL SERVICES SECTOR

DECEMBER 1986

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I ISSUES, TRENDS, AND EVENTS

- While the information services industry has experienced a slower pace of growth in the last year as the result of a slower economic climate throughout U.S. businesses, the impact on the professional services mode of the industry has been more moderate. This is due, in part, to the market pressures faced by corporate America that call for an improved quality and quantity of information support services. Professional services firms meet these needs by consulting with users on solutions to information systems problems, by developing or converting software for application on new or existing systems, and by operating and maintaining systems at peak levels through programs of facilities management or training and support of users.

- INPUT estimates that growth in user expenditures for contracted professional services from 1984 to 1985 was a healthy 18% and that this rate will continue on an annualized basis to 1991.

A. MARKET PRESSURES

- The key market forces that are impacting professional services (see Exhibit I-1) include:

  - The need to meet growing information systems demands in the face of a shortage of skilled in-house staff and a more complex technical environment.

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EXHIBIT I-1

MARKET PRESSURES

- Reduced In-House Capability
- Pervasiveness of Information Systems
- Demands for Productivity

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- The pervasiveness of information systems within client organizations and the criticality of these systems to corporate revenue generation.

- The demand, at the highest levels of the organization, for a more productive utilization of current corporate assets, including capital investments, human resources, and information assets.

I. GROWING DEMANDS - SHRINKING STAFFS

- While capital spending continued its downturn in 1985, INPUT expects a long-term positive growth in the installed base of computers. Much of the installed data processing equipment lacks the transaction speed and memory to satisfy future requirements. Some acquisitions are aimed at upgrading this equipment and converting or replacing the associated software systems. Commercial firms (e.g., American Airlines, Firestone, Northrop) as well as federal government agencies (e.g., Internal Revenue Service, Customs Service, Department of Defense) have planned and are upgrading systems that will support the ever-increasing requirements of information services well into the 1990s.

  - The aging of equipment in the face of advancing technology and the increasing demands placed on systems in support of a growing list of business user needs now require that replacements of obsolete equipment be made on a timely basis.

  - This replacement market is spurred by the additional capabilities of new systems. With information systems now at the very heart of corporate business, it is unlikely that management will risk the effects of under-capable systems.

- While professional services expenditures are likely to grow in support of existing systems, the key to the growth of professional services activities

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through new systems selection, installation, and management may be the speed with which small businesses automate. While even in economically tough times the largest corporations find such investments burdensome, but able to be done, it is the little company, hurt by the economy, that does not have the "contingency resources" to make capital investments when cash is desperately needed elsewhere. Only when these businesses experience financial upticks or make longer-term acquisition plans will capital investments and, therefore, professional services involving these new systems show a dramatic increase.

- Demand means not only more hardware but more and better solutions to an ever increasing complexity of technology that includes "super systems" that integrate several applications bound to fourth generation languages, data base management systems, code generators, and the like. Such systems may also include data that ranges from personal to corporate and requires micro-mainframe links and other extensions to intelligent workstations to handle end-user computing in a secure, data protected, and private system.

  - While the desire is present to integrate applications, there are few total solutions available for linking information systems to overall corporate plans. This is especially true in a multivendor environment that calls for the integration of voice, data, and image input and output. The interest in integrating applications in this environment has made the development and management of information systems much more complex. Many corporations lack the internal skills to handle the technical demands of these integration efforts.

  - Perhaps the good fortune of the current economy for professional services vendors is the shortage of skilled in-house workers. A shortage of skilled information systems personnel in any company, especially in a rapidly changing technical environment, makes professional services contracting quite attractive and necessary.

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- What seems to have occurred with respect to the continuation of employment of an in-house technical staff is tied, in part, to the financial health of the individual company and to the criticality of information systems to the company's business.

  - In "smokestack" industries, where information systems may not be central to the generation of revenue, the technical staff has been reduced to a point where little new development is possible and where the focus of the remaining staff is on the maintenance of existing systems.

  - Businesses that have been marginally successful in this slower economic climate seem to have taken one of two courses. If the current systems are adequate, the staff has likely been reduced, the in-house focus is on operation, and only high priority development efforts are contracted out. Or, if the environment is one of aging equipment, the staff is likely in place and focused on maintenance and all new starts are contracted out.

  - In situations where the information systems are critical to revenue generation or to remaining competitive, some amount of work is contracted, regardless of the current economic impacts.

- This segmentation has also served to differentiate sources of professional services contracts. On the one hand, corporate IS is bundling development efforts into larger and larger projects. On the other hand, individual work units, unable to meet their needs quickly and efficiently through an overworked in-house staff, are also contracting small professional services efforts.

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2. PERVASIVENESS OF INFORMATION SYSTEMS

- The impact of information systems is now visible throughout the corporation. The body of end users, employing a range of personal computers and small business minicomputers, will experience strong growth. And user interest in more powerful, complex systems will tax internal staff resources and expertise with demands for capabilities and connectivity.

- Company management has shown an increasing desire to automate the very core of their business. This has led to the need for more complex hardware, software, and communications solutions. Professional consultation during all stages of development, from conception to implementation, has become a necessity rather than an afterthought.

- The acceptance of automation as a competitive edge will continue to have a positive impact on the market. Once management is willing to invest in automation for this advantage, they are unwilling to wait for internally-developed solutions in such areas as decision support, customer service, sales/marketing, and time management.

- The pervasiveness of information systems has brought forth a concern for the proper management of the corporation's information systems assets, including hardware, personnel, and data/information. Chief executives now call for information resource management, a "master plan" for these vital systems.

  - Where these concerns are high, companies have moved from a reactive to a proactive mode, from a product orientation to a user orientation, and from a functional orientation to a "right information to the right person at the right time" orientation. IS management has now focused on containing costs and leveraging current assets, reducing maintenance costs, and prioritizing development efforts.

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3. PRODUCTIVITY DEMANDS

- Management has also focused on productivity increases. There is general consensus within both the user and vendor communities that there is an absorption bottleneck, a technical saturation.

- The proliferation of "solutions" has caused user confusion. Company managers are finding it increasingly difficult to choose among alternatives and, in the process, are postponing change until "the" solution emerges.

- Some companies have taken a deliberate "wait and see" attitude that calls for the development or adoption of "industry-wide" standards before moving further along the technical path.

- With the current "breather" from the rapid pace of development, many companies believe this is a time to rethink the direction and impact of their information systems efforts and to engage in an assessment of their IS function.

B. VIEWS OF CONTRACTORS

- While failures in large, complex projects receive "front page" attention, overall, professional services vendors have satisfactorily developed sophisticated applications for leading clients and, in the process, established an image of credibility. User organizations typically cite several advantages--and disadvantages--of contracting with professional services vendors.

1. ADVANTAGES OF USING PROFESSIONAL SERVICES VENDORS

- Contracting some development or operational activities gives a company the ability to balance workloads without changing staff counts as requirements are added or removed.

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- Contractors may be less expensive than fully-burdened in-house staff if a ceiling is used in the contracting. (It is for this reason that users are frequently opting for fixed-price bids.)

- Contractors' objectivity, which includes the ability of the contractor to take an unbiased approach to a problem without being affected by internal client politics, is, less frequently, also a consideration in employing professional services vendors.

- Expediency, in terms of accelerated schedules and fewer problems than if the work were performed in-house, is also a benefit of contracting.

2. DISADVANTAGES OF USING PROFESSIONAL SERVICES VENDORS

- There is always the risk of non-performance on the part of the contractor. The vendor may not deliver an acceptable product and/or may not deliver it on time or within budget.

- The time it takes the vendor to understand the user organization and its objectives and to come up to speed is longer than any in-house personnel would require. Users are reluctant to pay for this education and frequently offer repeat business to current vendors to avoid educating another vendor.

  - Related to this "learning curve," users are becoming more technologically sophisticated--or at least think they are--and are requiring a higher level of competence on the part of vendor personnel. Unless vendors pass along the additional costs of these "super staffers," they could be faced with shrinking margins in these situations.

  - Sometimes users are not more sophisticated but just think they are. The costs to the vendor in these cases come from the time it takes to re-educate the users without alienating them.

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- When professional services vendors are employed, the company does not develop the expertise inherent in the project within its in-house personnel. The skills developed during the course of an engagement remain with the vendor, and the user remains dependent on the contractor. Some managers believe that this weakens the company's ability to do additional work. They reason that since in-house staff skill is not built during a project, when the contractor leaves, the expertise leaves.

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II MARKET FORECASTS

A. PROFESSIONAL SERVICES MARKET OVERVIEW

1. MARKET FORECAST

- INPUT forecasts that the professional services market will grow from a 1986 base of $12.5 billion to $28.7 billion in 1991, an average annual growth rate (AAGR) of 18% (see Exhibit II-1). As discussed previously, keys to this growth include:

  - An economic climate that will result in a reduced in-house capability to maintain existing systems while meeting the complexities of new requirements.

  - The pervasiveness of information systems in corporate America, now a critical ingredient in capturing and maintaining market share.

  - The demands for increased productivity and greater leverage of corporate assets, including equipment, personnel, and data.

2. MARKET LEADERS

- The professional services market, because it includes a diverse set of "people-supplied" services, affords entry and exploitation from a variety of company

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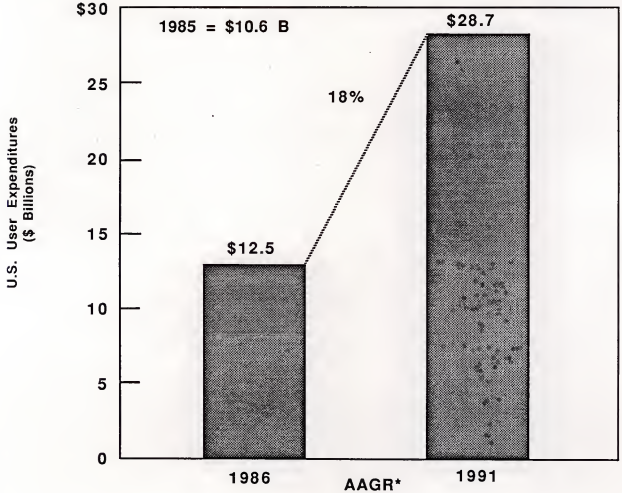
EXHIBIT II-1

PROFESSIONAL SERVICES MARKET, 1986-1991



* Average Annual Growth Rate

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capabilities. Accordingly, nearly every class of information services vendor has captured a share of this market. Exhibit II-2 lists this share information for the following classes of vendors (also see Appendix B).

- Computer Manufacturers. While these vendors are known primarily for manufacturing and selling computer hardware, some vendors such as IBM, Unisys, and Control Data Corporation do have substantial professional services businesses.

- Public Professional Services. Vendors that derive a majority of their revenue from professional services whose stock is publicly traded are included in this class. The larger vendors in this class are Computer Services Corporation, BDM International, Planning Research Corporation, and AGS.

- Professional Services ($250K to $10M). Professional services vendors whose stock is not publicly traded and who had 1985 revenue greater than $250,000 but less than $10 million are included here. Representatives include Applied Management Science, Genesys, and Systemhouse (publicly traded in Canada).

- Text/Audit. This classification includes "Big 8" certified public accounting firms such as Arthur Andersen; Peat, Marwick & Mitchell; and Price Waterhouse.

- Spinoffs. Professional services companies formed as a division of a firm not in the information services industry are included. This class is representedby such firms as Boeing Computer Services, Martin Marietta, and Grumman Data Systems.

- Private Professional Services (more than $10M). These vendors are similar to the public professional services firms except that they are privately held. They are also distinguished from other professional

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EXHIBIT II-2

U.S. PROFESSIONAL SERVICES INDUSTRY MARKET SHARE BY VENDOR CLASS, 1985

VENDOR CLASS	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
Computer Manufacturers	$2,079	20%
Public Professional Services	2,029	19
Professional Services (>$250K to <$10M)	1,566	15
Tax/Audit	1,113	11
Spinoffs	1,056	10
Private Professional Services (>$10M)	932	9
Professional Services (<$250K)	523	5
Processing/Network Services	361	3
Software Products	344	3
Management Consultants	284	3
Turnkey Systems	181	2
"Not-for-Profit"	103	<1%
Total Market	$10,571	100%

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services firms by their revenue size. DBA Systems, Cap Gemini, and Kentron International represent this class.

- Professional Services (less than $250K). Start-up firms are included here.

- Processing Network Services. Vendors predominantly known for their processing network services businesses but who have professional services revenue as well include SEI and Fidata.

- Software Products. Vendors such as Cullinet, CGA, and Vanguard that receive a majority of their revenue from the sale of packaged software products are included in this class.

- Management Consultants. Booz, Allen & Hamilton, the most widely known of the firms offering business consultancy, represents this group.

- Turnkey Systems. Frequently, vendors who provide packaged hardware/software systems also provide accompanying professional services. Computervision, HBO, and RGI are examples.

- "Not-for-Profit." These vendors, frequently associated with federal government projects, also compete for professional services business. This class includes Mitre, Batella Memorial Institute, and Carnegie Mellon.

- The leading vendors of professional services according to 1985 revenue are presented in Exhibit II-3. Interestingly, these top vendors account for only 35% of the total professional services market. And, less than 90 other vendors had professional services revenue greater than $10 million in 1985. A vast number of participants, over 1,400 with revenue greater than $200,000, share the majority of the revenue.

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EXHIBIT II-3

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines (IBM)	$977	9%
2	Computer Sciences Corp.	609	6%
3	Arthur Andersen	495	5%
4	General Motors/Electronic Data Systems	295	3%
5	Martin Marietta Data Systems	290	3%
6	Peat, Marwick, Mitchell & Co.	225	2%
6	Burroughs/Systems Development Corp.	225	2%
7	BDM International	220	2%
8	Sperry Computer Corp.	200	2%
9	Wang	150	1%

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- This change in the competitive structure will not only continue but will likely be exacerbated by recent changes in the market. Among the most prominent forces of this structural change is the increasing disparity between the dollar size and complexity of professional services assignments.

  - On the one hand are very large jobs, made that way by the technical complexities of the project or by a desire on the part of the user to create one large umbrella for a variety of planned professional services tasks.

  - On the other hand are generally much smaller jobs--in scope, if not in dollars--usually contracted by an IS subdivision or a work unit elsewhere in the corporation. These jobs tend to be critical, one-shot jobs rather than the monolythic assignments discussed above.

- Vendors, of course, are posturing to meet the varying requirements of this job segmentation.

  - Some niche vendors are cultivating end-user organizations with "user comfort" services that range from hardware/software microcomputer selection consulting and systems development work to education and training that addresses the needs of the individual in a specific application.

  - Other vendors strategize that the increasing specialization requirements of professional services contracts means price increases in compensation for this additional capability and/or greater leverage of staff resources. (The idea, of course, is to transform a $400/day programmer into a $1,000/day specialist.) Companies that have successfully established themselves as a recognized force in an industry or discipline include:

    . Auxton - communications.

    . Computer Task Group - banking and manufacturing.

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- Monchik Weber - finance.
- Bolt, Beranek & Newman - networks.
- Teknowledge - artificial intelligence.
- Booz, Allen & Hamilton - office systems.

- A third strategy being employed by the largest professional services vendors is the offering of full service, "one-stop shopping." By leveraging their financial resources to achieve economy-of-scale buying power, by developing a national, even an international, network of offices, and by developing partnering or teaming arrangements with other vendor professional services firms are offering themselves as the provider or conduit for all the user's information services needs.

- Note must also be made of entry into the market by vendors who have not been known for their professional services capabilities.

  - Software, turnkey, and processing services vendors wanting to add value to their products have entered this market.

  - Vendors from non-information services industries that have been hurt by the economic slowdown. National Intergroup, a subsidiary of USX (formerly U.S. Steel), is a good example.

  - The "Big 8" accounting firms that have increased their participation dramatically in the last two years.

- And, in a similar vein, there have been several instances of a crossover from the commercial sector of professional services to the federal government sector and vice versa.

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- The commercial vendors are attracted by the large size and long term of most government contracts. Government vendors usually enjoy a high rate of systems enhancements, extensions, and maintenance contract awards associated with initial awards. Many of these follow-on contracts are awarded on a sole-source, noncompetitive basis due to the vendor's unique experience and knowledge of the recently completed system.

- The federal vendors find the potential for revenue stability of the commercial sector as well as the freedom to price on a perceived value basis rather than on a regulated profit margin basis attractive. And, in the commercial sector they avoid the long, drawn out, expensive bidding process that vendors frequently encounter in the federal sector.

B. PROFESSIONAL SERVICES SECTORS

- The professional services market is segmented by INPUT into the commercial and federal government sectors. These two categories, while they have many similarities, differ in buying characteristics, terms and conditions of business, and implementation demands.

1. COMMERCIAL

- The commercial sector represents approximately two-thirds of the total professional services market. An annual growth rate of 20% is expected, moving the sector from $9.3 billion in 1986 to $22.7 billion in 1991 (see Exhibit II-4).

  - The market size and growth rates for the vertical industries are presented in Exhibit II-5, and issues and trends in each market are discussed in depth in U.S. Information Services Vertical Markets,

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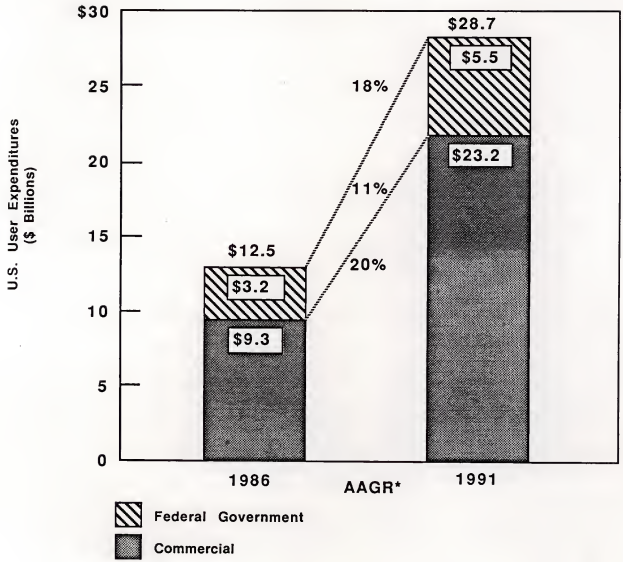
EXHIBIT II-4

PROFESSIONAL SERVICES MARKET SECTOR, 1986-1991



* Average Annual Growth Rate

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EXHIBIT II-5

INDUSTRY PROFESSIONAL SERVICES MARKETS

INDUSTRY SECTOR	1986-1991 AAGR (Percent)	USER EXPENDITURES ($ Billions)	
		1986	1991
Discrete Manufacturing	22%	$2.1	$5.7
Process Manufacturing	22%	1.1	3.1
Transportation	21%	0.2	0.4
Utilities	9%	0.07	0.1
Telecommunications	23%	0.5	1.4
Distribution	18%	0.6	1.5
Banking and Finance	18%	1.5	3.5
Insurance	16%	0.9	1.9
Medical	22%	0.3	0.7
Education	9%	0.07	0.1
Services	19%	0.2	0.4
Federal Government	11%	3.2	5.5
State/Local Government	19%	1.6	3.8
"Other" Industry	20%	0.3	0.7
Total	20%		

*Totals may not equal high-level numbers due to rounding.

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1986-1991. Briefly, this exhibit suggests that the competitive requirements under the current deregulated environment as well as the need for greater productivity in producing and managing goods and services are propelling certain industries.

- Telecommunications companies as well as banking and financial institutions lead in the drive to employ professional services firms to help in the development of automated systems that will establish their competitive edge.

- The efficient production of goods, most notably in discrete and process manufacturing, is increasing expenditures for professional services as these firms seek productivity gains that will free them from the bonds of an expensive labor market in the U.S. and allow them to more ably compete with cheaper "offshore" producers of goods.

- The medical and distribution industries require professional services to gain a greater control over the management of goods and services. This is especially true in the medical industry where the population in general has become more health conscious and where the growing number of senior citizens require more medical attention under Medicare and Medicaid.

- The leading professional services vendors in the commercial sector in 1985 are listed in Exhibit II-6.

2. FEDERAL GOVERNMENT

- The U.S. government is the largest single user of information technology in the world. In 1986, over $16 billion was spent on information technology. More than 120,000 federal workers currently manage over 20,000 medium- and large-scale computers and over 200,000 microcomputers.

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EXHIBIT II-6

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
COMMERCIAL SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines (IBM)	$875	11%
2	Arthur Andersen	440	6%
3	Computer Sciences Corp.	308	4%
4	Peat, Marwick, Mitchell & Co.	212	3%
5	Burroughs/Systems Development Corp.	153	2%
6	Wang	150	2%
7	Price Waterhouse	123	2%
8	AGS	120	2%
9	General Motors/Electronic Data Systems	114	1%
10	BDM International	108	1%

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- While federal agencies were among the first organizations to develop automated information and service delivery systems, by the late 1970s the federal government's leadership in computer applications was eroding. The government found itself dependent on outdated, cost-inefficient systems.

- The federal government has a need through the remainder of the decade to steadily improve the quality and quantity of data processing services. This must be done, in part, by overcoming the handicap of a rapidly aging equipment inventory. However, constraints applied by budget and personnel reductions make the goal that much harder to achieve.

- The federal government does not currently have the in-house staff required to support the quality and quantity of DP-related services required. Consequently, much of the work that would otherwise remain in-house will be contracted.

- This need for outside professional services contractors to support the requirements of the federal government is evidenced by the increasing budget allocations, the need to expand federal DP capabilities through a modernization program, and the implementation of policies that freeze federal staffing levels and move more information services support functions to the private sector.

- Much of the existing inventory of DP lacks flexibility, transaction speed, and memory to satisfy current and future requirements. Most current and planned acquisitions are aimed at upgrading or replacing these systems. An objective of the upgrades is a reduction in the long-term costs of maintenance and software development that has frequently resulted when information systems support requirements change without corresponding changes in systems capabilities.

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a. Forecast

- Today, the federal government is in the midst of modernizing its computers and data processing systems. There will be a continuing demand for contracted services. The federal government professional services market will increase, INPUT estimates, from $3.2 billion in 1986 to $5.5 billion in 1991, an average annual growth rate of 11% (see Exhibit II-4). The need for professional services to support the government's rebuilding goals will continue to make federal government professional services the largest single, externally-contracted information services segment of the federal market. (This forecast excludes classified systems, particularly those in the intelligence community, and weapons systems.)

- The federal government professional services market will continue to be moderate as the government seeks to improve both the quality and quantity of automatic data processing supported services within the budget constraints imposed on it. Key among the forces that will sustain this market are:

  - A federal workforce heavily committed to maintaining existing software systems and inadequately staffed to develop much-needed new systems.

  - Pressure to reduce the federal budget deficit that makes efficiency and innovation paramount.

  - Executive directives that now require federal agencies to utilize contractors rather than perform the work in-house if outside contracting proves to be cost-effective.

  - Technology, particularly in the area of microprocessors, that is advancing at a rate that requires the importation of expertise.

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- There are negatives to the federal market, including the liabilities of contracting in a highly regulated and adversarial environment, the business risks associated with unique user requirements, and the increasing amount of competition.

  - The federal government professional services market has become increasingly competitive in the past few years. Small businesses, minority-owned businesses, and large aerospace vendors represent three types of new competitors who have come to this market from nontraditional quarters.

- Continuing federal budget pressures as well as this growing amount of competition has created a price-sensitive market where the winners are working with progressively narrower margins, more tightly controlled overhead, and reduced management structure. Among the practices with which vendors must contend are:

  - "Should cost" estimates that agencies typically establish before reviewing bids which include an independent review of the specifications, an estimate of the likely cost of the project, and/or a comparison of the cost of in-house and contractor performance of services in an attempt to determine if in-house development is, in fact, more expensive than commercial acquisition.

  - Congressional pressure for fixed-price contracts to avoid cost overruns.

  - "Most favored customer" regulations that require vendors to certify that the price quoted is the lowest price the vendor has received in the last six months and is at least 10% less than the vendor's comparable prices in commercial markets.

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b. Leaders

- This market is dominated by systems houses and hardware firms. The firms require a broad range of in-house or consultant skills to meet systems integration and implementation requirements. Hardware firms are providing systems employing other company hardware that best meet client needs and price requirements (see Exhibit II-7).

- Competition in the federal government professional services arena is complicated by the continually changing pattern of vendor teams for different programs. Today's bidding partners are tomorrow's competitors, and vice versa.

C. PROFESSIONAL SERVICES DELIVERY MODES

1. OVERVIEW

- The structure of the professional services market by types of activities is presented in Exhibit II-8 and discussed briefly below.

a. Software Development

- Also called programming and analysis, this service develops software systems on a custom basis and includes:

  - Hardware and/or software system design.

  - Custom software development.

  - Modification of commercial software packages.

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EXHIBIT II-7

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
FEDERAL GOVERNMENT SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	Computer Sciences Corp.	$301	11%
2	Martin Marietta Data Systems	237	9%
3	General Motors/Electronic Data Systems	181	7%
4	Planning Research Corp.	118	4%
5	BDM International	112	4%
6	International Business Machines (IBM)	102	4%
7	Sperry Computer Corp.	100	4%
8	Burroughs/Systems Development Corp.	72	3%
9	Science Applications International Corp.	69	2%
10	American Management Systems	58	2%

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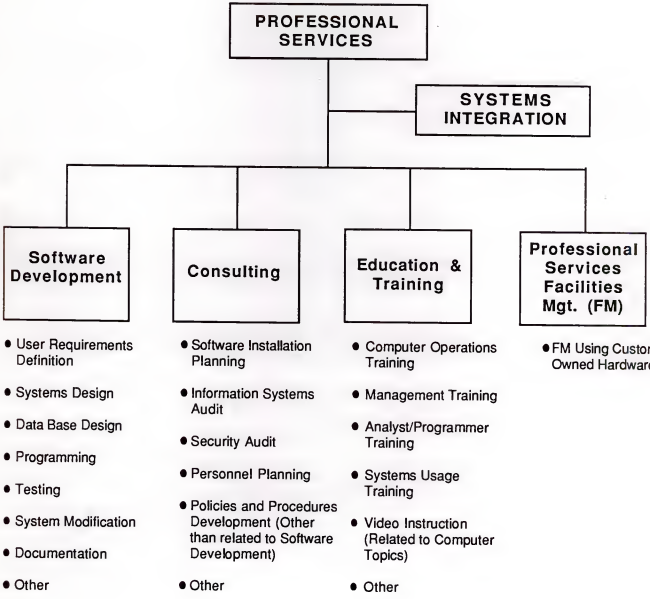
EXHIBIT II-8

PROFESSIONAL SERVICES MARKET STRUCTURE



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- Software testing of both custom and commercial packages.

- Software conversion.

- Maintenance of operating and applications software.

- Independent verification and validation of software packages prepared by other vendors.

b. Consulting

- Consulting ranges from special studies to the preparation of specifications of information systems resources required to meet specific needs. The service provided is management-oriented consulting, including feasibility studies, requirements analyses, systems audits, and technical direction and assistance consulting.

c. Education and Training

- Education and training of managers, professionals, and technicians involves the development of new skills, techniques, or knowledge in such areas as operations, programming, and software maintenance. A range of resources may be used including manuals and live instruction (video-based and computer-based).

d. Systems Integration

- Systems integration (SI) includes subsets of other professional services, packaged by the vendor in such a way that the contracted services have the appearance of a single-source vendor. SI services are generally associated with the design and implementation of DP/telecommunications systems by one or more separately contracted vendors rather than by a prime contractor typical in custom turnkey contracts. SI is usually associated with custom

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hardware/software projects, particularly with high-risk efforts such as substantial systems upgrades and replacements.

- While the primary activity is a professional service, the complexity of the project may involve other information services for which the integrator, a prime contractor, or a subcontractor receives revenue.

e. Facilities Management

- Facilities management includes the operation and maintenance of user owned or leased automatic data processing equipment including vendor operation, maintenance, and, occasionally, overall resource management.

- Professional services facilities management differs from processing services facilities management in that in professional services FM the computing equipment is owned or leased by the client, not the vendor. The vendor provides only the staff to operate, maintain, and manage the facility. FM may also involve site preparation and installation tasks.

2. FORECASTS

- The forecasts by professional service delivery mode are presented in Exhibit II-9 and discussed in detail below. Software development is by far the largest segment and will grow at an annual rate of 15%, just slightly below the overall market. Consulting and education and training will grow at a faster annual rate, but the combined user expenditures will still be less than software development in 1991.

a. Software Development

- The forecast for software development is presented in Exhibit II-10 and the industry leaders in Exhibit II-11.

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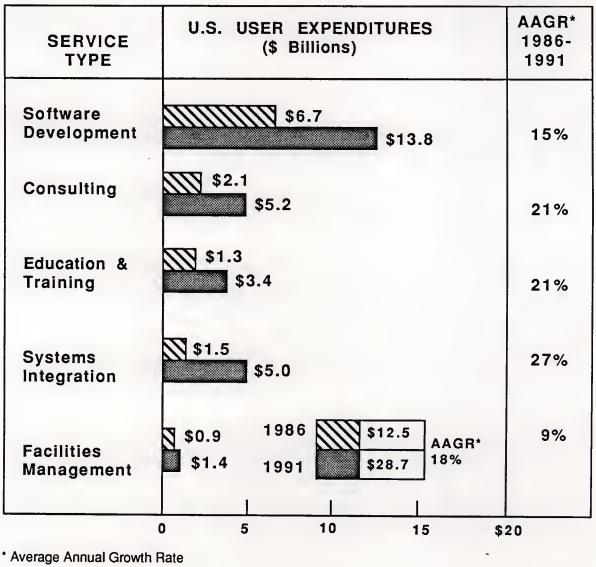
PROFESSIONAL SERVICES MARKET BY SERVICE TYPE, 1986-1991



* Average Annual Growth Rate

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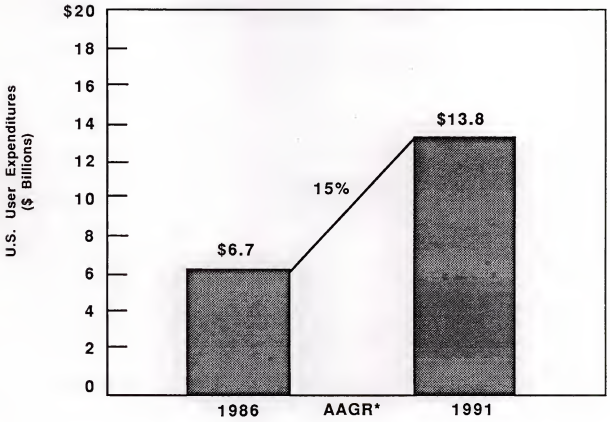
EXHIBIT II-10

SOFTWARE DEVELOPMENT MARKET, 1986-1991



* Average Annual Growth Rate

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U.S. INFORMATION SERVICES INDUSTRY PROFESSIONAL SERVICES LEADERS, 1985 SOFTWARE DEVELOPMENT SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines	$474	8%
2	Arthur Andersen	340	6%
3	Peat, Marwick, Mitchell & Co.	220	4%
4	Computer Sciences Corp.	183	3%
5	Burroughs/Systems Development Corp.	127	2%
6	Price Waterhouse	105	2%
7	Wang	95	2%
8	AGS	86	1%
9	BDM International	80	1%
10	Computer Task Group	74	1%

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- In general, software development will continue to be a healthy delivery mode for several reasons (see Exhibit II-12).

  - As discussed earlier, the user community has a lack of skilled in-house personnel to maintain existing systems and develop much needed new systems. In part, this lack of staff is due to the economic climate that has forced major reductions in the size of the staff that is maintained on a full-time basis. In some instances the staff may be present but unable to focus on new development because of demands on their time from an aging equipment inventory or from the lack of up-to-date technical skills required to implement new technologies. Regardless of the particular reason, vendors should find a large market for systems development work, either on a "body shop" basis or through out-of-house developed systems.

  - Comparison of the cost of in-house staff and contractor performance of professional services has always been a focal point in the decision to acquire professional services. In today's market this continues to be the case, but rising corporate overhead and the salary levels usually commanded by staff versed in newer technologies is indicating that contractors' fees are comparable to fully burdened in-house rates. The key, of course, is the notion of "fully burdened." Users must be made aware of the full costs of the in- house staff in any comparisons of internal versus external costs.

  - Growth will be stimulated by new software tools, either incorporated within applications packages or on a standalone basis. These tools promise to increase productivity of programmers and enhance the attractiveness of professional services offerings. Vendors are learning that a "tool box" concept of systems development that includes reusable code in the form of generalizable modules provides leverage from one project to another.

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EXHIBIT II-12

KEY ISSUES
SOFTWARE DEVELOPMENT

- Lack of Skilled In-House Resources
- Embedded Software Tools
- More Powerful and Flexible Software Packages
- "Buy and Tie" Approach
- Extensive Competition

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- There are offsetting influences in this market that vendors must address. Chief among these is the growing list of alternatives available to the user in the form of more powerful and flexible software packages that, in many instances, now include embedded tools to ease the efforts of modification and maintenance.

- With a plethora of more powerful software available to a user community suffering under slower growth, the "perceived" systems uniqueness that drove users to custom development may be shrinking. Users seem more willing to "buy and tie" software packages than in the recent past.

- Not only are software vendors expanding their offerings horizontally in their respective vertical markets, but they are adding their own professional services to maintain control of software and capture the modification/maintenance expenditures that have gone to professional services firms in the near past.

b. Consulting

- Consulting services is a smaller, but equally important part, of professional services vendors' offerings. INPUT estimates that user expenditures will increase from $2.1 billion in 1986 to $5.2 billion in 1991, an AAGR of 21% (see Exhibit II-13 for this forecast and Exhibit II-14 for the industry leaders in consulting).

- Exhibit II-15 lists some of the major issues and strategies of this delivery mode.

- A key impetus of growth is the corporate level of visibility now "enjoyed" by information systems. The level of capital investment, the criticality of these systems to the business, and the productivity gains through connectivity and compatability all serve to focus management's attention on information

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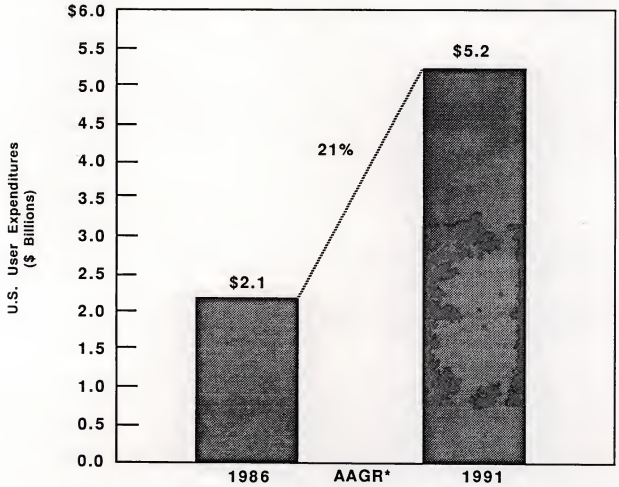
CONSULTING MARKET, 1986-1991



* Average Annual Growth Rate

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U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
CONSULTING SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines (IBM)	$210	12%
2	Booz, Allen & Hamilton	75	4%
3	Computer Sciences Corp.	72	4%
4	BDM International	70	4%
5	Burroughs/Systems Development Corp.	63	4%
6	Digital Equipment Corp.	62	4%
7	Bolt, Beranek & Newman	60	3%
8	Sperry Computer Corp.	50	3%
9	MITRE	49	3%

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EXHIBIT II-15

KEY ISSUES
CONSULTING

- Corporate Visibility of DP
- Plethora of "Solutions"
- Competition from Non DP-Oriented Vendors

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systems. These internal pressures, coupled with the availability of a wide variety of "solutions," require that users seek expert counsel to keep current on near- and long-term developments in the multitude of disciplines related to information systems.

- Professional services vendors are in a unique position to provide management with an objective, up-to-date assessment of where the company is, where it should be going, and how to get there efficiently.

- The concern is so large and the impact of systems so diffuse that many non-professional services vendors have become involved in systems consulting. Traditional information services vendors may need to establish their credentials from both a technical capabilities and vertical industry expertise position to secure business.

c. Education and Training

- Education and training is one of those markets which shows tremendous potential but which is difficult to capture on any large share basis. U.S. businesses spent an estimated $40 billion to educate and train their personnel in 1985, but there are few vendors that could claim any more than a single-digit share of that amount.

- The portion spent on education and training in the information services industry amounted to $1.1 billion in 1985. INPUT forecasts that this will grow at an annual rate of 21% and reach $3.4 billion in 1991 (see Exhibit II-16).

- Very few professional services vendors have no education and training offering, but what is offered by the majority of vendors is of an ancillary, add-on, customer service nature. The user expenditures received by the major vendors of education and training are depicted in Exhibit II-17.

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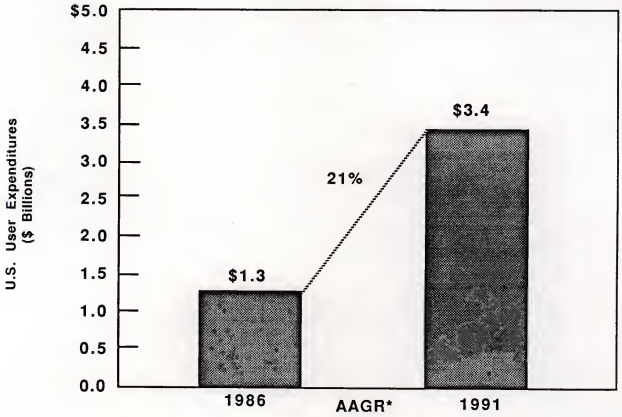
EXHIBIT II-16

EDUCATION AND TRAINING MARKET, 1986-1991



* Average Annual Growth Rate

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EXHIBIT II-17

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
EDUCATION AND TRAINING SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines (IBM)	$132	12%
2	McGraw-Hill	120	11%
3	Arthur Andersen	60	5%
4	Deltak	60	5%
5	Computervision	49	4%
6	General Motors/Electronic Data Systems	34	3%
7	Logicon	33	3%
8	Computer Sciences Corp.	30	3%
9	ASI	30	3%
10	Computer Horizons	26	2%

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- A key force in this segment of the market is the ubiquity of computing within companies (see Exhibit II-18). The growing number of users of automated information systems has increased education and training needs and refocused them at the work unit level. While professional services vendors will have a more difficult time finding key contacts at this work unit level, without question they must address this level and, in the process, should find pockets of potential.

- A strong opportunity exists for training personnel on newly evolving, complex software development tools, hardware, and telecommunications. If companies are going to have any hope of remaining technologically current and if they are going to attract and retain personnel, they must offer up-to-date training.

- As mentioned earlier, however, it is extremely difficult to identify a concentrated enough group to make a profitable standalone education and training offering, especially for live or video-based instruction. The unique needs of companies and individuals within those companies makes the identification of a critical mass very difficult. Without that mass, it is generally not profitable for vendors who add on education and training to provide the same packages on a standalone basis.

- Even when an attractive mass is identified, professional services vendors usually find it difficult to keep materials current. It is for this reason that computer-based instruction, an ideal medium for large, diffuse groups that need to learn a standard procedure or technique, has met little success. Technical advances and company changes makes current instruction in any form other than "live" very difficult.

- For all of these reasons, the perceived value of education outside of a specific application is quite low. Users have had too many disappointing experiences with questionable content and poor presentations to be willing to pay any kind of a premium.

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EXHIBIT III-18

KEY ISSUES
EDUCATION AND TRAINING

- Ubiquity of Automated Information Systems
- Rapid Technical Changes
- Lack of a Critical Mass
- Low Perceived Value

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- In short, education and training, although growing at a rapid rate, is only for those specialized vendors who understand and can produce quality current educational courseware in a price-sensitive market.

d. Systems Integration

- Systems integration, added to INPUT's professional services market as a separate delivery mode for the first time in 1986, represents one of the most exciting areas of professional services. While the federal government has sought integration capabilities from vendors for some time, the commercial sector is just now realizing the benefits of doing so.

- This segment should grow at an annual rate of 27% from the 1986 level of $1.5 billion to $5.0 billion in 1991 (see Exhibit II-19).

- Leaders in this segment are primarily vendors with a history of federal government contracting (see Exhibit II-20). These vendors are now porting these unique skills to the commercial sector and competing with traditional commercial vendors who are developing skills to meet emerging needs involved with large, complex projects.

- The complexities of some development projects simply demand a team of vendors with recognized expertise in a multitude of disciplines. No single vendor currently has all of the capabilities required in these types of projects and few vendors have the buying power that comes from economies of scale that is also frequently required.

- From the users' perspective, the driving force (see Exhibit II-21) is the need to consolidate a variety of applications that are now only loosely connected. For example, companies are realizing a need to integrate core accounting functions with payroll, inventory management, and various accounting modules all under the umbrella of a central data base management system.

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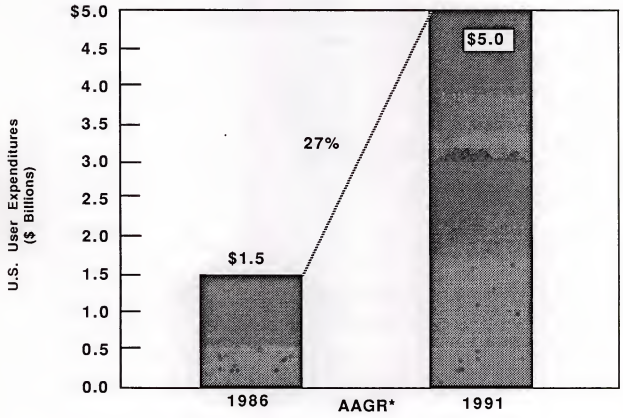
EXHIBIT II-19

SYSTEMS INTEGRATION MARKET, 1986-1991



* Average Annual Growth Rate

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EXHIBIT II-20

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
SYSTEMS INTEGRATION SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	International Business Machines	$161	13%
2	General Motors/Electronic Data Systems	154	13%
3	Martin Marietta	152	13%
4	Computer Sciences Corp.	100	8%
5	Sperry Computer Corp.	75	6%
6	Arthur Andersen	65	5%
7	Science Applications International	60	5%
8	Planning Research Corp.	42	4%
9	American Management Systems	30	3%
10	BDM International	25	2%

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EXHIBIT II-21

KEY ISSUES
SYSTEMS INTEGRATION

- Consolidation of Applications
- Myriad of Alternatives
- Multivendor Environment
- Account Control
- Lack of Adversarial Mentality
- Political Factors

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- Also, this integration must take place by sorting out a myriad of alternatives and a multivendor environment that frequently prohibits straightforward interfaces.

- There are problems to be overcome before the full potential of systems integration will be realized by vendors.

  - Systems integration may require a company to turn over control of the entire information system to the integrator. Not only is this risky for the user on an operational basis, but also in the sense that the expertise for the system remains in the hands of the vendor, not the user.

  - There is also the concern that the commercial market does not have the adversarial mentality that may be required for systems integration. In the federal government, where the bidding and implementation processes are so highly regulated, laws exist to protect federal agencies from the results of unsuccessful efforts. And agencies, as we all know from reading the headlines, are not afraid to take the vendor to court to settle differences. On the commercial side, however, these laws do not exist, and even if they did, it is unlikely that a company would desire to suffer the bad press that might result from a lawsuit.

  - Companies also face the political risks associated with the elimination of jobs that seem to be inevitable in such automation efforts. The tremendous cost of a large integration project can only be offset by the elimination of jobs. If these are union jobs, the problem only becomes compounded.

  - The chief concern among vendors is the lack of experience they have had in systems integration. Some efforts may call for a level of expertise in complex operating environments, for example, that few independent vendors have. While most vendors feel that it is a benefit to be independent of a particular brand of hardware for the sake of

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objectivity, these vendors realize that this independence requires additional learning that may, in fact, not be readily available. The answer may be multiple relationships among independent vendors and hardware manufacturers.

e. Facilities Management

- The client-owned contractor-operated market of facilities management will experience only moderate growth in user expenditures. As depicted in Exhibit II-22, INPUT forecasts that this market will grow from $0.9 billion in 1986 to $1.4 billion in 1991, an AAGR of just 9%.

- Much of these expenditures are from the federal government sector where outside contractors are frequently required to run government-owned data centers for agencies experiencing cutbacks in staff as a result of deficit control measures. The facilities management leaders as well represent federal government contractors in this segment (see Exhibit II-23).

- While the lack of a skilled in-house staff available to run sophisticated systems will remain a positive force (see Exhibit II-24), this will be mitigated, in part, by increases in training of available staff that will allow this in-house group to operate and maintain these systems.

- As they become more capable of financing the capital investment, vendors will offer and clients will accept vendor-owned facilities management, classified by INPUT under the processing/network services delivery mode.

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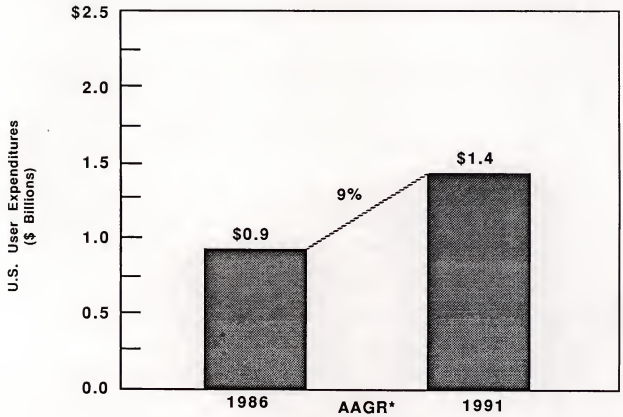
EXHIBIT II-22

FACILITIES MANAGEMENT MARKET, 1986-1991



* Average Annual Growth Rate

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EXHIBIT II-23

U.S. INFORMATION SERVICES INDUSTRY
PROFESSIONAL SERVICES LEADERS, 1985
FACILITIES MANAGEMENT SEGMENT

RANK	VENDOR	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	Computer Sciences Corp.	$224	31%
2	Martin Marietta Data Systems	85	12%
3	Dynamics Research	45	6%
4	Allied/Bendix	41	6%
5	Lockheed/LEMSCO	36	5%
6	BDM International	35	5%
7	General Motors/Electronic Data Systems	30	4%
8	Dynalectron	29	4%
9	Sperry Corp.	25	3%
10	Technology Development of California	21	3%

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EXHIBIT II-24

KEY ISSUES
FACILITIES MANAGEMENT

- Sophisticated Systems
- Lack of Skilled In-House Staff
- Move to Vendor-Owned/Vendor-Operated FM

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III PROFESSIONAL SERVICES MARKET OPPORTUNITIES

A. GENERAL APPLICATION TARGETS

- Although individual companies have unique requirements that specify different application needs, there are some general application targets that vendors may wish to explore (see Exhibit III-1).

  - Major opportunities exist for applications that provide new information systems that represent upgrades or expansions of capabilities relating to day-to-day operations.

  - Data management capabilities and data base management systems will become particularly important as users attempt to organize their information resources and establish a more productive operating environment.

  - Office automation applications should be fruitful for vendors who offer solutions for the integration of incompatible hardware and meet the need for increased end-user support. Textual data bases and other document handling routines, when combined with digital image processing, could be key factors in establishing a distinct capability in the area of electronic publishing. It is the office automation arena, incidentally, where systems integration approaches seem particularly applicable as a means of dealing with multiple technologies.

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EXHIBIT III-1

MARKET OPPORTUNITIES

APPLICATIONS TARGETS

- Information Systems Upgrades
- Data Management
- Office Automation
- Human Resources
- Supercomputers

INDUSTRIES

- Banking and Finance
- Manufacturing
- Federal Government

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- Automation of human resources applications also appears to offer a strong potential. The "cafeteria style" of human resources fostered by the desire to provide more services while containing costs have put development in this area on the users' priority lists. While this would seem to be another area where the integration of the human resources function and an umbrella data base would appear to be a reasonable approach, the cost of doing so may fall outside the bounds of the "must have" category and be treated as a discretionary item.

- A growing user comfort with supercomputer-based applications suggests that expertise in this technology may result in a significant payoff. There does continue to be confusion over the proper role of supercomputers. While vendors have approached transaction-intensive businesses with supercomputer applications, the more logical place may be in situations requiring large-scale modeling capabilities. Control Data Corporation and Boeing Computer Services have both had success in these environments, although most of the applications have been in the federal government sector.

- A particular concern surrounding these applications is software management. With a significant amount of every data processing dollar spent on maintenance of existing software systems, there is a need to improve software maintenance tools to reduce these costs.

B. INDUSTRY TARGETS

- The banking and finance industry, as mentioned earlier, continues to show promise. Businesses in this industry have needs for applications systems such as demand deposit accounting, loan application processing, and customer information files.

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- In the manufacturing arena, interest continues to include process control applications and materials management.

- The federal government sector has recently been acquiring professional services for such target applications as administrative and logistics systems, financial management and budget control, and scientific applications that include space exploration, energy, and weapons development.

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IV RECOMMENDATIONS AND CONCLUSIONS

- The process of selecting a vendor for a professional services contract is one of professional evaluation. The bid selection criteria, while varying from client to client, usually involves:
  - Proposed technical solution.
  - Vendor reputation for providing satisfactory services.
  - Corporate commitment to providing support.
  - Risk containment procedures, including reporting schemes and progress report.
  - Cost.

A. GENERAL CONSIDERATIONS

- While many of the above selection criteria specifically imply the type of action required for success, other criteria may need additional commentary (see Exhibit IV-1).

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EXHIBIT IV-1

RECOMMENDATIONS

- Emphasize Support
- Firm Up Project Management
- Gather Prospect Intelligence
- Know the Risks
- Understand the Client
- Develop Capabilities

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- Vendors should emphasize their support capabilities and performance in their bids. Many service vendors cannot provide evidence of customer satisfaction since they do not carry out systematic surveys in this area.

- Economic pressures and the growing amount of competition is creating a price-sensitive market where the winners will be working with progressively narrower margins, more tightly controlled overhead, and reduced management structure.

- Bid development now requires in-depth pre-solicitation intelligence and early executive management involvement. Companies that fail to accurately assess their prospects find themselves wasting scarce proposal dollars in expensive bidding failures.

B. SPECIFIC RECOMMENDATIONS

1. KNOW THE RISKS INVOLVED

- Vendors provide professional services to clients under a variety of contract types:

  - Cost-plus contracts provide for vendor costs to be paid and a fee added that is either negotiated (cost-plus fixed-fee) or based upon the performance of the contractor in satisfying the contract requirements (cost-plus award fee). Cost-plus contracts effectively regulate the margin of profit allowed, but clearly place the risk with the client.

  - Fixed-price contracts commit vendors to perform and complete a contract at a predetermined price ceiling. To a significant extent, the profitability associated with a fixed-price contract is dependent upon the vendor's ability to accurately appraise, in advance, the costs of

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providing the services specified. Managing fixed-price contracts successfully requires an extremely well written and detailed statement of work and project scope. The risk of completion is placed squarely on the vendor.

- Level of effort or time and materials contracts provide for an hourly billing plus reimbursement for out-of-pocket expenses required to satisfy the terms of the contract. In some instances, vendors are required to combine their contract with a "not to exceed" clause that essentially imposes cost ceilings.

- While vendors generally prefer cost-plus or level of effort contracts without cost ceilings over fixed price because those contracts minimize the financial risk to the vendor, users do prefer fixed-price. Vendors should identify the conditions under which they can accept fixed-price contracts, since clients, especially federal agencies, have shown a clear preference for fixed-price. This may mean that vendors must find and implement methods of pricing and contract managment that allow them to minimize the risks of performance on a fixed-price basis.

- The maturity of some portions of the professional services market, especially code conversion and facilities management, narrows the allowable cost envelope for successful contract bidders. Incumbent vendors, especially in the federal government, cannot assume that cost and profit recovery will come automatically in recompetition of the current support services contract.

  - However, some activites are inherently less risky. Operation and maintenance, for example, represents a market that, while not always as attractive as developing state-of-the-art systems, is less risky and often financially more rewarding.

- Just as clients employ contractors to overcome personnel shortages, vendors may also face labor pool shortages in specific hardware and software systems

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and/or in particular geographic areas. Failure to resolve these shortages in the pre-bid stage can be expensive in both overhead and management costs after award.

2. UNDERSTAND THE CLIENT

- Vendors should increase their intelligence-gathering activities and develop a thorough understanding of the client's needs and objectives that goes far beyond the stated contract requirements. This must be done during the bid development process, but should also be a standard practice performed without regard to specific opportunities.

3. DEVELOP CAPABILITIES

- With professional services vendors continuing to employ a strategy of niche development, it behooves all vendors to reassess their strategies for competing with this developing expertise. For some vendors this assessment should identify their strengths and allow them to plan for, first, strengthening these assets and then, second, covering those that can be easily developed.

- In the latter case, the idea of strategic partnering is frequently employed and must be employed by systems integrators.

  - With few individual vendors able to meet the demands required in widespread, multidimensional systems and even fewer with the R&D capability to advance these capabilities in newer technologies while spending to capture and successfully complete assignments, many vendors have sought partners among other information services providers.

  - This concept suggests that the unique requirements of a targeted opportunity be used to guide the vendor's selection of products, services, and capabilities needed to satisfy these requirements.

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Whether the products/services are developed in-house or licensed or purchased from another vendor, the goal of strategic partnering is to satisfy the user requirements in a manner that offers the user the appearance of the vendor as a single source of service for a wide spectrum of requirements, including post-development services such as training, documentation, maintenance, and ongoing support.

- There are negatives associated with partnering.

  . Partnering cannot compensate for fundamental vendor weaknesses and may, in fact, accentuate them by creating mutual dependencies.

  . Partnering in a reactive mode clouds the dynamics that are vital to the development of a healthy sharing relationship.

  . Partnering may call for teaming with vendors who otherwise would be competitors. This may violate business instinct.

C. CONCLUSIONS

- Although the economic climate has had a negative impact on the information services industry, the professional services segment appears headed for a steady, attractive growth cycle.

- Individual vendor growth is not assured, and the increasing amount of competition, both from within and outside the industry, only serves to reinforce the need for an ongoing program of market assessment, company capability assessment, and the resulting congruency analysis. Key to this assessment is an objective, fact-based answer to the following questions:

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- Can we (the vendor) identify an attractive market segment?

- Can we capture a meaningful share of that segment?

- Will the costs of doing so be worth the effort?

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APPENDIX PS-A: FORECAST DATA BASE: PROFESSIONAL SERVICES SECTOR

- INPUT's data base of market forecasts for professional services is included in this appendix.
  - Exhibit PS-A-1 presents the data base by market sector.
  - Exhibit PS-A-2 presents the data base by vertical industry.

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EXHIBIT PS-A-1

PROFESSIONAL SERVICES USER EXPENDITURES BY TYPE OF SERVICE, 1986-1991 ($ MILLIONS)

SEGMENTATION	1985	1985-1986 GROWTH	1986	1987	1988	1989	1990	1991	AAGR* 1986-1991
FEDERAL GOVT. SECTOR PROFESSIONAL SERVICES									
Software Development	$850	13%	$961	$1,078	$1,220	$1,285	$1,443	$1,652	11%
Consulting	305	16%	355	370	390	430	450	480	6%
Education & Training	250	8%	270	300	330	370	400	410	9%
Systems Integration	789	15%	904	1,026	1,189	1,399	1,634	1,924	16%
Facilities Management	570	30%	740	800	860	930	990	1,070	8%
Subtotal	$2,764	17%	$3,230	$3,574	$3,989	$4,414	$4,917	$5,536	11%
COMMERCIAL SECTOR PROFESSIONAL SERVICES									
Software Development	$4,964	18%	$6,078	$7,324	$8,680	$10,317	$12,054	$13,646	18%
Consulting	1,420	21%	1,782	2,020	2,465	3,107	2,969	5,121	24%
Education & Training	854	24%	1,071	1,232	1,540	1,910	2,382	3,077	24%
Systems Integration	409	18%	151	167	205	306	408	509	28%
Facilities Management	160	9%	175	191	210	233	266	310	12%
Subtotal	$7,807	19%	$9,257	$10,934	$13,100	$15,873	$19,079	$22,663	20%
GRAND TOTAL PROFESSIONAL SERVICES									
Software Development	$5,814	17%	$7,039	$8,402	$9,900	$11,602	$13,497	$15,298	17%
Consulting	1,725	20%	2,137	2,390	2,855	3,537	4,4192	5,601	21%
Education & Training	1,104	20%	1,341	1,532	1,870	2,280	2,782	3,487	21%
Systems Integration	1,198	15%	1,055	1,193	1,394	1,705	2,042	2,433	18%
Facilities Management	730	25%	915	991	1,070	1,163	1,256	1,380	9%
Grand Total	$10,571	18%	$12,487	$14,508	$17,089	$20,287	$23,996	$28,199	18%

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EXHIBIT PS-A-2

PROFESSIONAL SERVICES USER EXPENDITURES FORECAST BY VERTICAL INDUSTRY, 1986-1991 ($ MILLIONS)

SEGMENTATION	1985	1985-1986 GROWTH	1986	1987	1988	1989	1990	1991	AAGR* 1986-1991
INDUSTRY-SECTOR									
Discrete Manufacturing	$1,695	23%	$2,089	$2,712	$3,327	$4,071	$4,764	$5,688	21%
Process Manufacturing	932	19%	1,109	1,259	1,427	1,836	2,432	3,045	22%
Transportation	137	15%	157	184	215	256	305	407	21%
Utilities	67	10%	74	83	90	96	103	112	9%
Telecommunications	392	25%	489	611	764	955	1,193	1,392	23%
Distribution	536	17%	625	735	945	1,140	1,290	1,460	18%
Banking and Finance	1,250	19%	1,490	1,773	2,110	2,511	2,988	3,456	18%
Insurance	811	16%	940	1,082	1,244	1,431	1,645	1,950	16%
Medical	220	21%	266	324	399	494	598	724	22%
Education	65	8%	70	77	84	92	101	110	9%
Services	140	16%	163	189	219	258	302	397	19%
Federal Government	2,764	17%	3,230	3,574	3,989	4,414	4,917	5,536	11%
State & Local Government	1,342	17%	1,575	1,764	2,099	2,498	2,973	3,475	17%
"Other" Industry	220	20%	265	331	401	490	570	673	20%
Grand Total	$10,571	19%	$12,542	$14,698	$17,313	$20,542	$24,181	$28,835	18%

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APPENDIX PS-B: PROFESSIONAL SERVICES USER EXPENDITURES BY VENDOR CLASS, 1985

- Exhibit PS-B-1 allocates 1985 professional services user expenditures into five vendor categories (columns):
  - Software development.
  - Consulting.
  - Education and training.
  - Systems integration.
  - Facilities management.
- Each category is divided into non-federal and federal markets.
- In addition, 12 vendor classes are provided (rows):
  - Professional services (less than $250K).
  - Private professional services (more than $250K but less than $10M).
  - Private professional services (more than $10M).

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EXHIBIT PS-B-1

PROFESSIONAL SERVICES USER EXPENDITURES BY VENDOR CLASS, 1985
($ Millions)

VENDOR CLASS	Non-Federal SW Dev.	Federal SW Dev.	Total SW Dev.	Non-Federal Consultant	Federal Consultant	Total Consultant	Non-Federal E&T	Federal E&T	Total E&T	Non-Federal Syst. Int.	Federal Systems Int.	Total Syst. Int.	Non-Federal Fac. Mgmt.	Federal Fac. Mgmt.	Total Fac. Mgmt.	Total Non-Federal P/F Svs.	Total Federal P/F Svs.	Total Total P/F Svs.
Professional Services (<250K)	$ 388	$ 16	$ 404	$ 77	$ 2	$ 79	$ 40	0	$ 40	0	0	0	0	0	0	$ 505	$ 16	$ 523
Private Professional Services (>$250) (<$10M)	1,316	26	1,342	109	4	113	69	$ 7	76	0	$ 17	$ 17	0	$ 16	$ 18	1,494	72	1,566
Private Professional Services (>$10M)	406	146	552	42	51	93	53	51	104	$ 29	56	87	2	94	96	532	400	932
Tax/Audit	790	36	826	61	16	77	79	6	85	80	45	125	0	0	0	1,011	102	1,113
Computer Manufacturers	835	120	955	475	15	490	222	42	264	165	140	305	19	45	64	1,716	363	2,079
Management Consulting	66	21	107	63	46	129	12	6	16	0	30	30	0	0	0	161	103	284
Not-for-Profit	25	33	58	1	39	40	0	5	5	0	0	0	0	0	0	26	77	103
Processing/Network Services	208	10	218	27	6	33	16	2	18	0	0	0	92	0	92	343	16	361
Public Professional Services	562	321	883	364	66	430	110	78	188	53	230	283	17	228	245	1,106	924	1,430
Software Products Vendors	125	35	160	128	6	134	40	10	50	0	0	0	0	0	0	293	51	344
Spinoffs	191	71	262	53	45	98	91	39	130	62	269	351	30	185	215	447	609	1,056
Turnkey Systems Vendors	33	15	48	0	8	8	121	4	125	0	0	0	0	0	0	154	27	181
Total Professional Services	$4,985	$ 650	$5,615	$1,420	$ 304	$1,724	$ 853	$ 250	$ 113	$ 409	$ 789	$1,198	$ 180	$ 570	$730	$7,808	$2,164	$9,972

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- Tax/audit.
- Computer manufacturers.
- Management consulting.
- Not-for-profit.
- Processing/network services.
- Public provessional services.
- Software products vendors.
- Spinoffs.
- Turnkey systems vendors.

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APPENDIX PS-C: DATA BASE RECONCILIATION

- INPUT's reconciliations of the data base between the 1985 professional services market report and the 1986 report are presented as Exhibit PS-C-1 (vertical industries) and Exhibit PS-C-2 (commercial and federal government sectors).

A. 1985 BASE YEAR RECONCILIATION

- The net adjustment from the 1985 report made to professional services user expenditures was a small $28 million. Changes within industries did occur.

  - The most dramatic adjustment, a reduction of $582 million, occurred in the federal government. The adjustment is discussed in detail in the U.S. Information Services Vertical Markets, 1986-1991, Federal Government Sector. Briefly, the adjustment reflects the substantial impact of increased expenditures for telecommunications equipment and services resulting from the AT&T divestiture. With much of the information technology funding committed to current contracts, federal agencies were forced to slow expenditures for planned contracted services, including professional services. New software development was impacted the most as noncritical improvements were delayed.

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PROFESSIONAL SERVICES - DATA BASE RECONCILIATION OF MARKET FORECAST BY INDUSTRY SECTOR

SEGMENTATION	1985 MARKET			1990 MARKET			1985-1990 AAGR Forecast in 1985 Report (Percent)	1986-1991 AAGR Forecast in 1986 Report (Percent)
	1985 Forecast	1986 Report	Variance as % of 1986 Report	1985 Forecast	1986 Forecast	Variance as % of 1986 Forecast		
Discrete Manufacturing	$1,681	$1,695	-1%	$4,579	$4,764	-4%	22%	22%
Process Manufacturing	791	932	-15%	2,101	2,432	-14%	22%	22%
Transportation	137	137	0%	305	305	0%	17%	21%
Utilities	67	67	0%	103	103	0%	9%	9%
Telecommunications	305	392	-22%	968	1,193	-19%	26%	23%
Distribution	486	536	-9%	1,064	1,290	-18%	17%	18%
Banking and Finance	1,254	1,250	0%	3,500	2,988	17%	23%	18%
Insurance	706	811	-13%	1,757	1,645	7%	20%	16%
Medical	220	220	0%	598	598	0%	22%	22%
Education	65	65	0%	101	101	0%	9%	9%
Services	140	140	0%	302	302	0%	17%	19%
Federal Government	3,346	2,764	21%	7,844	4,917	60%	19%	11%
State & Local Government	1,121	1,342	-16%	2,608	2,973	-12%	18%	19%
"Other" Industry	220	220	-5%	485	570	-15%	18%	20%
Grand Total	$10,539	$10,571	0%	$26,315	$24,181	10%	20%	18%

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EXHIBIT PS-C-2

PROFESSIONAL SERVICES - DATA BASE RECONCILIATION OF MARKET FORECAST BY DELIVERY MODE

SEGMENTATION	1985 MARKET			1990 MARKET			1985-1990 AAGR Forecast in 1985 Report (Percent)	1986-1991 AAGR Forecast in 1986 Report (Percent)
	1985 Forecast	1986 Report	Variance as % of 1986 Report	1985 Forecast	1986 Forecast	Variance as % of 1986 Forecast		
FEDERAL GOVERNMENT PROFESSIONAL SERVICES			*					
Software Development	$1,362	$ 850	60%	$3,248	$1,443	125%	19%	11%
Consulting	345	305	13%	717	450	59%	16%	6%
Education & Training	274	250	10%	807	400	102%	24%	9%
Systems Integration	800	789	1%	2,162	1,634	32%	22%	16%
Facilities Management	565	570	-1%	910	990	-8%	10%	8%
Subtotal	$3,346	$2,764	21%	$7,844	$4,917	60%	19%	11%
COMMERCIAL PROFESSIONAL SERVICES								
Software Development	$4,871	$4,964	-2%	$12,005	$10,445	15%	20%	16%
Consulting	1,372	1,420	-3%	3,634	3,900	-7%	22%	23%
Education & Training	775	854	-9%	2,545	2,405	6%	27%	23%
Systems Integration	*	409	*	*	2,248		*	38%
Facilities Management	165	160	3%	287	266	8%	12%	12%
Subtotal	$7,183	$7,807	-8%	$18,471	$19,264	9%	21%	20%
GRAND TOTAL PROFESSIONAL SERVICES								
Software Development	$6,233	$5,814	7%	$15,253	$11,888	28%	20%	15%
Consulting	1,717	1,725	0%	4,351	4,350	0%	20%	21%
Education & Training	1,049	1,104	-5%	2,252	2,805	20%	26%	21%
Systems Integration	800	1,198	-33%	2,162	3,882	-4%	22%	27%
Facilities Management	730	730	0%	1,197	1,256	-5%	10%	9%
Grand Total	$10,529	$10,571	0%	$25,215	$24,181	9%	20%	18%

*Commercial Systems Integration was not specifically identified in the 1985 report.

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- This reduction was offset by smaller increases in professional services expenditures in commercial industries.

  - The base for process manufacturing was increased 15% in reflection of additional developments of software for microcomputer-based applications in design and analysis.

  - The telecommunications industry has recently increased software development expenditures to replace systems that were previously supplied by AT&T. Development of systems for new business ventures has also increased.

  - Insurance companies have also increased expenditures for the design and development of fraud detection systems and policy management systems. Training on these and other systems has also resulted in increased expenditures.

  - An addition of $221 million was applied to the state and local government industry. In addition to the development of systems to manage responsibilities passed on by the federal government, expenditures have increased for accounting, tax assessment and collection, and personal property registrations.

B. 1990 FORECAST YEAR RECONCILIATION

- Outyear variances reflect changes in the 1985 base discussed above and changes in the rate of growth. Overall, the professional services market has slowed as the result of the changing economic climate, and INPUT expects the market to be 10% smaller in 1990 than forecast last year.

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- Much of this slowdown is the result of the decrease in both expenditures and anticipated growth in the federal government. In addition to reducing spending in 1985, federal agencies have pared funding requests at least through fiscal year 1987. Agencies are implementing deficit control measures, including Gramm-Rudman-Hollings, that will delay planned upgrades and new starts. All service modes except facilities management will be affected.

- Commercial sector industries that will slow, either as a result of economic pressures or the completion of the current phase of building include banking and finance and insurance. Modest gains are expected in transportation and services.

- By mode of professional services delivery, education and training has the largest variance with last year's report. It is unlikely that the low perceived value of education will change easily or that vendors will find the "critical mass" encouraging standalone offerings.

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I INTRODUCTION

- Systems software comprises three segments--application development tools (ADT), data center management (DCM), and system control (SC). Products in these categories work with the computer system and related software to develop and support business solutions. Exhibit I-1 highlights the major product types included in each segment.

- The systems software market in 1985 was one of the healthiest segments of the information services industry. It had a 23% growth from 1984-1985, as opposed to the overall information services market which had a 17% growth.

- There are inherent characteristics in most systems software products that contributed to that growth. Most of these capitalized on the fact that there was a tightening in the U.S. economy which created the desire to make existing computer resources (i.e., people and products) more efficient. In general, major system software products (excluding operating systems):

  - Are designed to improve productivity of people and efficiency of systems.

  - Deliver quantifiable results.

  - Are easy and fast to install.

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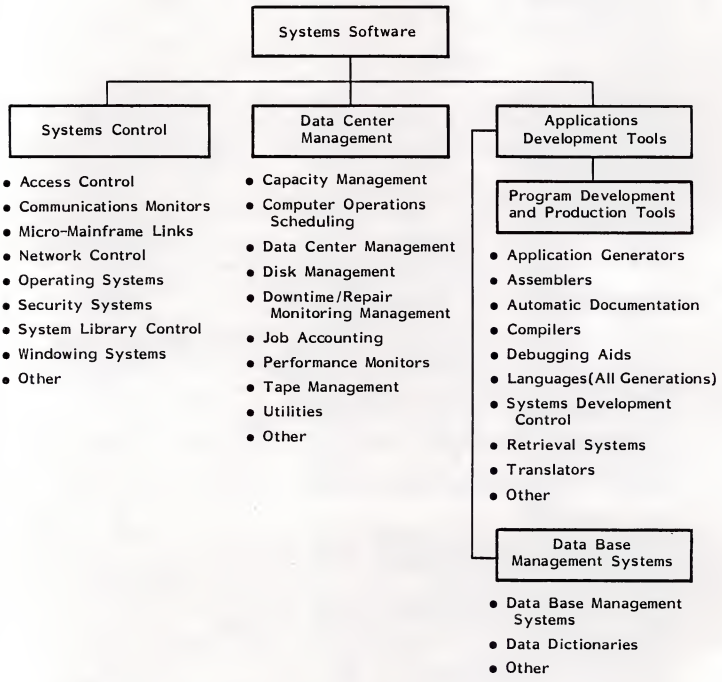
EXHIBIT I-1

SYSTEMS SOFTWARE PRODUCTS MARKET STRUCTURE



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- Are low-cost products (less than $50,000) and, consequently, tactical and not strategic products to a corporation. This means that the purchase decision can be made by a few, thus shortening the selling cycle.

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II ISSUES, TRENDS, AND EVENTS

A. OVERVIEW

- There are a number of issues and trends in the industry that have or will occur and that will have a significant impact on the systems software market. The combination of all these forces and their positive or negative impact on the market are vital data that led to the analysis which creates the five-year forecast. Major issues, trends, and events are listed in Exhibit II-1.

B. ECONOMY

- As previously mentioned in the introduction, the state of the economy has a direct impact on the systems software market. In 1985 and 1986, the economy was tighter than several preceding years which led to an overall decrease in capital spending. This directly impacted the information services industry.

  - Segments of the industry were impacted either positively or negatively depending on the necessity of application to the overall corporation, the cost of the product, and the degree to which added value could be "squeezed" from existing personnel and/or equipment.

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EXHIBIT II-1

SYSTEMS SOFTWARE
ISSUES/TRENDS/EVENTS

- Tightening of the Economy
- IBM's Software Thrust
  - MVS/XA
  - DB2
  - Price Increases
  - Strategic Alliances
- Relational DBMSs Increase in Popularity
- AI
- Hardware Trends
- Acquisitions

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- Consequently, the professional services market, on-line data bases, and systems software are the segments of the IS industry that have successfully met these criteria and had healthy growth rates between 1985 and 1986.

    . Professional service vendors could be hired on a contract basis rather than hire new full-time employees. They also provided education and training and systems integration that improved the efficiency of users, programmers, and systems.

    . On-line data bases increase the efficiency of financial and other white collar workers.

    . Systems software, again, improves the efficiency of programmers as well as systems.

C. IBM

1. OVERVIEW

- IBM is the leading vendor of hardware and, therefore, operating systems--the major systems software product. The company has firmly stated its commitment to becoming a major player in all four delivery modes.

- In 1985, IBM's worldwide revenue from all types of software was $4 billion, a 30% increase over 1984. Currently, its software revenue is about 8% of overall corporate revenue, but growing at 30% per year would give IBM worldwide software revenue of $15 billion by 1990, representing about 15-20% of overall IBM corporate revenue.

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- Specifically in the area of systems software, IBM dominates the list of vendors with $2.5 billion (1985 U.S.) of revenue from operating system (OS) and related software. This is 41% of the total 1985 systems software market of $6.1 billion. See Exhibit II-2 for a 1985-1986 comparison of IBM's software revenue components.

2. XA

- In the late 1970s, as larger capacity host processors became available, effective management of system resources became difficult. As user workload increased the requirement for systems resources, major capacity constraints became apparent.

- To alleviate these constraints, IBM introduced a new systems architecture in 1981. The architecture was called XA (extended architecture), and the OS to complement the hardware was MVS/SP2 or MVS/XA.

- IBM corporate objectives include:

  - Being a complete information provider.

  - Locking out PCMs via hardware design and operating system (OS) software.

  - Minimizing the number of supported OS.

  - Maximizing account control.

- IBM's aggressive support of MVS/XA affirms all four objectives:

  - XA is a major systems software product around which IBM and other vendors can provide add-on enhancement products as well as professional services offerings.

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EXHIBIT II-2

IBM SOFTWARE REVENUE
($ BILLIONS)

	1985		1986	
	WORLDWIDE	U.S.	WORLDWIDE	U.S.
Applications	$0.45	$$0.32	$0.60	$0.50
Operating Systems and Utilities	$2.80	$2.00	$3.70	$2.70
DBMS	$0.75	$0.48	$0.90	$0.60
Total Systems Software	$3.55	$2.50	$4.60	$3.30
Total Software	$4.00	$2.80	$5.20	$3.80

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- Should IBM choose, it could add micro code assists to XA for efficiency, which at the same time would make it more difficult for PCMs to compete.

- With XA, heavy transaction processing applications can be supported for some years to come, requiring only OS enhancements, not a completely new OS. VM will support information center and mid-range applications.

- Once users have applications developed on one type of OS, switching to other vendor's hardware is very unlikely. Hardware upgrades will most likely be within the same vendor and product line.

- XA is also a major contributing factor to IBM's overall corporate revenue goal of 15% per year growth.

  - IBM receives recurring revenue of about $15,000 per month from each XA installation with associated software and maintenance. This is about three times the monthly charge of MVS and related services and more than ten times the monthly license fee of DOS.

  - Consequently, as the number of XA installations increases (while at the same time the capabilities of XA increase and stimulate price increases), so, too, will IBM's overall revenue.

3. DB2

- IBM is primarily a hardware vendor.

- Taken a step further, the more IBM can do to help users install applications more quickly, the sooner users will be ready to purchase more hardware; hence, the strategic implication of DB2, IBM's relational data base product for large systems.

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- DB2 takes full advantage of the XA architecture; thus, users with MVS/XA wishing to maximize system efficiency with the use of a DBMS will need to install DB2.

- Supplemental information regarding versus hierarchical DBMS will be disclosed in a subsequent section of this report.

- Historically, a DBMS has been used for transaction processing. For this type of function, IBM has a large installed base (with recurring revenue) of IMS, its hierarchical DBMS product (about 6,000 units worldwide).

- With the increase of end-user computing, a need has evolved for an easier-to-use host DBMS product, thus the evolution of relational DBMS. IBM has positioned DB2 as a complement to IMS to be used for new applications so as not to "initially" replace IMS. INPUT believes that within the next five years, as IBM improves the performance of DB2 with hardware assists and software enhancements, DB2 will begin to be marketed as a replacement for IMS as well. In about ten years, most applications presently under IMS will be under DB2.

  - In 1985, IBM had about $15 million in revenue from DB2 sales. This small revenue amount in no way discounts the strategic importance of DB2.

  - In 1985, there were about 500 units of DB2 installed worldwide.

  - In 1986, to encourage the use of DB2, IBM gave users the opportunity to use DB2 free for six months if the product was licensed prior to September 1986.

  - The price of DB2 is surprisingly low compared to other host DBMS products ($16,000 initial license and $2,500 per month).

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- Short-term year-to-year revenue from DB2 is of less importance to IBM than a long-term installed base of the product and the ensuing sale of hardware.

- In spite of the fact that DB2 is a strategic product for IBM, independent vendors can capitalize on its deficiencies as well as provide links between DB2 with their products. DB2 presently lacks a wide variety of tools, a data dictionary, and strong security functions.

  - Software AG will have interfaces from its host data base, ADABAS, to DB2 and will rewrite its fourth generation language, NATURAL, to work with DB2.

  - Relational Technology, Inc. has tools to develop applications to run on top of DB2.

- Long-term, IBM will improve upon DB2 deficiencies. It is said to be working on a central "repository" that will manage data definitions as well as terminal definitions. IBM also has a 4GL, CSP, that is similar to Cincom's Mantis and runs on VSAM, DL/I, IMS, DB2, and System/36.

4. PRICE INCREASES

- IBM has been criticized for raising the prices of its software at least once a year, regardless of product enhancements. This has historically been true.

  - Consequently, price increases can limit the opportunities of independent vendors since they decrease the overall budget available for companies to spend on other products.

  - In less strategic areas (not OS), however, IBM price increases provide vendors with quality products with the ability to be more competitive due to lower cost products.

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- In 1986, however, IBM was more selective on raising prices of products; this comes as a response to customer complaints. In the face of increased hardware competition (notably DEC), IBM has an added desire to keep customers happy and maintain its installed base as well as increase sales.

  - The newly-announced 9370 family will have certain software priced according to product capability, meaning that the same OS would be priced differently based on the capability of the machine.

  - Changes to the XA OS were announced in October 1986 with no change in price.

5. STRATEGIC ALLIANCES

- All the major software markets that IBM and independents have targeted are growing rapidly. In most markets there is no leader. This is not, however, the case in two segments of the systems software market--OS and DBMS. Excluding these segments, there is a variety of opportunities for vendors.

- The markets, however, are rapidly changing, and buyer requirements are becoming more complex. IBM and independents are finding mutual benefits from strategic alliances.

- Most of IBM's alliances to date were not in the systems software area. There are, however, some notable exceptions. IBM has the following alliances in systems software:

  - VM Software - VM DCM products.

  - Microsoft - PC-DOS license.

  - Oracle - Oracle DBMS for IBM System/88 (Stratus) computer.

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- IBM will continue making alliances as long as the software products enhance and encourage the sale of hardware.

D. RELATIONAL/DISTRIBUTED DBMS

- DBMS are application development tools (ADTs) that make the filing, sorting, and retrieving of data more efficient. Historically, DBMSs have been hierarchical, i.e., data structures are organized in a "parent to child" relationship.

- Due in large part to the major infusion of end-user computing in corporations, a major thrust has been made toward relational DBMSs. Relational DBMSs structure data in "table type" relationships. IBM SQL (Structured Query Language) is evolving as the standard access method for relational data bases. SQL is a Data Manipulation Language (DML). A DBMS is a compiler or interpreter for a DML, whereby simple statements can make a complex update.

- The next evolutionary step is distributed DBMS (DDBMS), which must be relational. There are two approaches to distributing data bases:

  - Split one DBMS among many machines.

  - Have separate DBMSs on separate machines transparent to users.

- Products of this type are in the beginning stages.

  - Oracle has just announced SQL Star that links SQL DBMS from mainframe to PC and allows data to be viewed as a single source even though it may be geographically separate.

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- RTI (Relational Technology, Inc.) is presently working with the federal government and DoD for the development of a distributed DBMS with remote access and update.

- Sybase has a SQL-based DataServer.

- IBM is known to be working on a distributed DBMS, RStar, that is still in beta test.

- Although DDBMS products soon will be available, they have been designed for access without updating the data. Security and data integrity are key concerns and must be successfully addressed before update products are available.

- Users are in the planning stages now for DDBMS and will purchase products only after they have proven themselves over time.

E. ARTIFICIAL INTELLIGENCE (AI)

- Rather than being a product, artifical intelligence (AI) is a collection of technologies. AI techniques incorporated into software products will be used for a number of different applications:

  - To access corporate mainframe data bases with a natural language system.

  - To provide expert systems that assist users in improving the quality of their work and allow them to make better decisions.

  - To provide natural languages on the front end to simplify the accessing of CD-ROM.

  - To provide software that learns and adapts to a user.

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- AI technologies will be increasingly added to systems software products, especially in the application development tools area, to increase productivity and simplify the access of DBMS.

F. HARDWARE TRENDS

1. OVERVIEW

- The number of units in the installed base has a direct correlation to the number of system software products that can be sold.
  - In the case of OS, there is generally one OS per CPU. For large IBM 370 architecture systems the ratio is 1.3 OS units per CPU, on average.
  - In the case of utilities and tools performing specific functions, a much larger number of products are run per CPU. However, there is a limit to the number of utilities that can be run per CPU.
- Consequently, changes in the number of units, as well as hardware systems and architecture capability, in the installed base directly impact the design as well as the number of shipments of systems software products per year.

2. DECREASE IN MAINFRAME SALES

- In 1986, INPUT estimates that there are about 40,000 large systems (IBM 4300 and above and "BUNCH") installed in the U.S. The year-to-year growth rate of these systems has slowed in 1986 to about 8% for IBM and less for non-IBM large systems. Decreases in 1985-1986 growth are due to:
  - The perceived discontinuance of the Investment Tax Credit at year end 1985. As a result, many users pushed purchases planned for early 1986

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ahead to fourth quarter 1985, so they could still get full tax credit for the hardware investment.

- Confusion due to connecting diverse hardware systems within the corporation postponed new purchases.

- Economic conditions postponed new sales of large systems over $1 million.

- In the near past, the yearly increase in mainframe capacity (MIPS) installation was about 50%; in 1986, this increase per year has slowed to 30% or less.

- INPUT projects that the impact of the aforementioned factors will lessen over time and, due in large part to the drive toward connectivity, large system (43XX, 308X, and 3090) sales will increase in growth rate.

3. POPULARITY OF DEC VAX

- In 1986, there were about 50,000 DEC VAXs (including MicroVAX) installed in the U.S. That number is increasing at 15-20% per year. Connectivity and the desire by users for a consistent architecture from large to small systems are spurring this growth.

- Of the installed base of VAXs, only one-half have some type of DBMS (as opposed to large IBM and "BUNCH" systems where about 90% have at least one DBMS). Of those that do have a DBMS, about 30% have RDB (DEC's product), 7% have RTI, 6% Oracle, and 6% Intergraph. The remaining systems have any of a number of products supplied by 20 other vendors.

  - The large growth in the VAX installed base presents opportunities for systems software vendors.

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- . Cullinet has announced its commitment to enter the VAX DBMS market in mid-1987.

- . Software AG and Cincom are moving their products to the VAX line.

- There are two major caveats:

  - . The sale of a VAX product into a corporation, in general, is not to the same department where traditional mainframe vendors are accustomed to selling; therefore, a new selling strategy may be in order.

  - . Although there is a lack of DBMS products on VAXs, there are established leaders in that market (previously mentioned vendors) whose products were designed, not reworked, for the VAX environment.

4. PC AND 80286 AND 80386

- In 1986, there were about nine million microcomputers installed in U.S. businesses. This number is expected to more than double from 1986-1991. Contributing to the increases in the installed base are:

  - Increased system capacity.

  - Increased end-user computer literacy.

  - Increased availability of applications software.

  - Decreased system cost.

  - Development of comprehensive micro strategies in large businesses.

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- IBM (and clone product makers) have been reasonably successful in the past two years selling AT-type products. This is in spite of the fact that due to OS constraints, the products were able to only run existing PC-DOS applications faster, but could not address the two megabytes of memory nor address the protected mode. In early 1987, IBM and Microsoft will announce a DOS286 to alleviate these constraints.

- In mid-1986, Compaq was the first hardware vendor to introduce a micro based on the 80386 chip, and other hardware vendors are expected to follow suit. Software providers of sophisticated OS and software will announce products in late 1987 to take advantage of the system capabilities. At that time IBM will also introduce an 80386-chip micro.

- Consequently, new opportunities will appear for vendors of systems software products in all segments (ADT, DCM, SC) using these new micros.

G. ACQUISITIONS

- Acquisitions are increasing in the systems software area as well as in most other segments of the information services industry. Due to rapid industry changes, companies are finding that acquiring smaller players with established quality products and distribution channels is more cost- and time-effective for market penetration than developing similar products internally.

  - In late 1985, Ameritech acquired Applied Data Research, known to be an innovator and one of the first independent manufacturers of IBM 370 DBMS, as a first step in entering the information services market.

  - Pansophic, one of the leading suppliers of mainframe tools, acquired the D-PICT graphics product and the INGOT DSS product in early 1986

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and SPSS, developer of SPSS statistical software, later in the year to broaden their product line.

- Computer Associates International acquired the mainframe security product, Topsecret, from CGA and Software International.

- In 1985, Sterling Software acquired Informatics General and has since consolidated the company to make it a higher revenue generator.

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III MARKET FORECASTS

A. OVERVIEW

- The systems software market continues to experience strong growth. In 1985, over $6 billion was spent on systems software. With an expected 24% AAGR for 1986-1991, almost $22 billion will be spent in 1991 (see Exhibit III-1). In 1986, systems software accounted for 47% of the overall software market; in 1991 this percentage will increase to 51% (see Exhibit III-2), highlighting the need for tools and aids to support increasingly complex application solutions.

- Of the more than $6.1 billion in user expenditures in 1985 for systems software, 62% ($3.8 billion) was for mainframe packages, 26% ($1.6 billion) for mini packages, and 12% ($0.7 billion) for micro products.

  - The higher percentage for mainframe and mini products is not surprising as those types of software products systems have a higher average unit price.

  - Stimulating the increase of mainframe percent of market is the increased sales of IBM large systems and the ensuing OS licenses.

- With the growth of micros and their increasing usefulness as productivity tools, rapid systems software expansion will occur. Starting from a much smaller base than systems software products for larger systems, the micro

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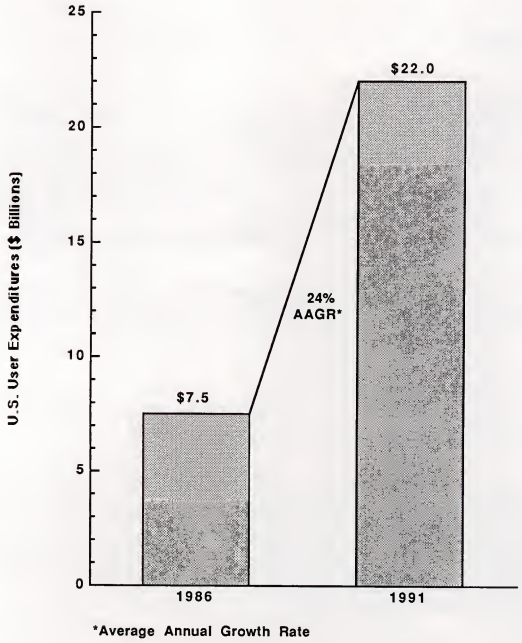
EXHIBIT III-1

SYSTEMS SOFTWARE MARKET, 1986-1991



*Average Annual Growth Rate

MSPA-SSJz

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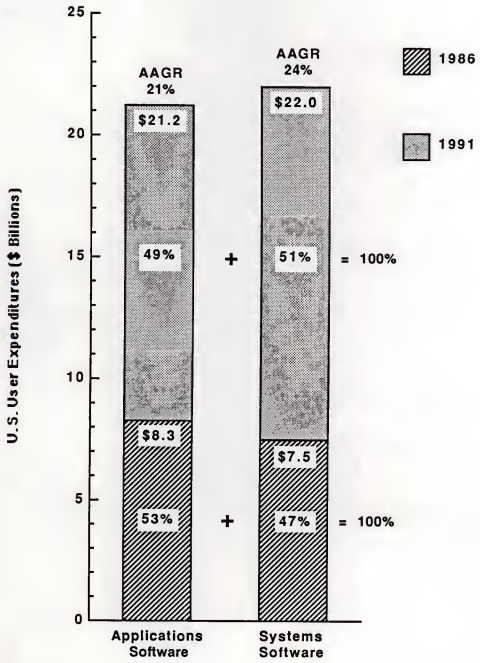
EXHIBIT III-2

SOFTWARE PRODUCTS MARKETS, 1986-1991



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segment will have a 36% AAGR from 1986-1991 (see Exhibits III-3, III-4, and III-5).

B. LEADING VENDORS

- In the systems software market in 1985, hardware vendors accounted for the vast majority of user expenditures. The major segment from which these vendors derive revenue is systems control (due to vendor-supplied and often proprietary OS).

- IBM is the only major hardware vendor that provides a significant amount of micro systems software (primarily the PC-DOS OS). Since the average revenue to IBM per system is relatively small, IBM's micro systems software revenue and, consequently, the revenue of hardware vendors as a whole in this micro segment is relatively small.

- Leading systems software vendors and their market shares for 1985 are listed in Exhibit III-6. Since IBM has such an overwhelming percentage of the market, Exhibit III-7 is provided listing the top independent (non-hardware) systems software vendors.

C. SEGMENT OVERVIEW

- Systems software market segments are highlighted in Exhibit III-8. All three segments will have healthy five-year growth rates, but the systems control segment will be the largest market segment in 1991 by a significant margin. An explanation for the growth in specific segments follows.

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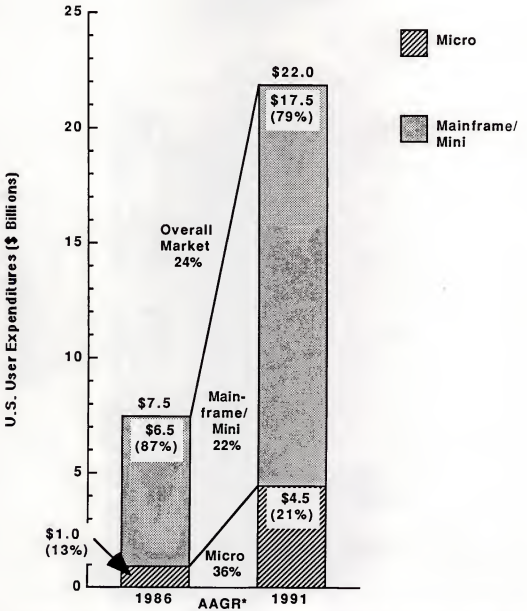
EXHIBIT III-3

SYSTEMS SOFTWARE GROWTH, 1986-1991



Note: Percent of 1985 and 1991 systems software markets are shown in parentheses.

*Average Annual Growth Rate

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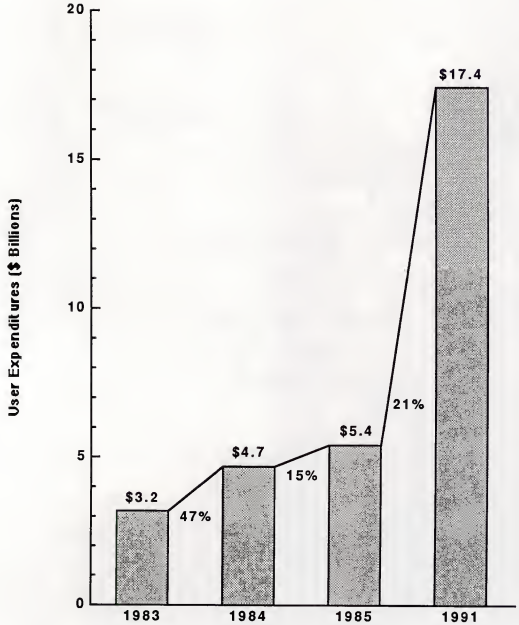
EXHIBIT III-4

MAINFRAME/MINI SYSTEMS SOFTWARE*
U.S. BUSINESS



*Includes Application Development Tools, Data Center Management, and Systems Control.

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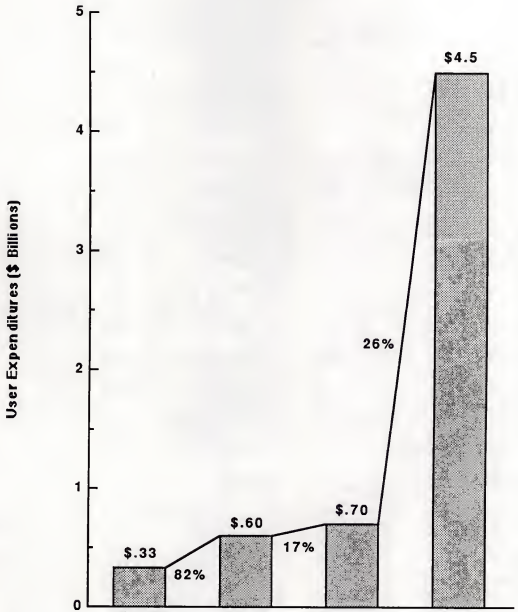
MICROCOMPUTER SYSTEMS SOFTWARE*
U.S. BUSINESS



*Includes: Application Development Tools, Data Center Management, and Systems Control.

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EXHIBIT III-6

SYSTEMS SOFTWARE PRODUCT LEADERS, 1985

RANK	COMPANY	USER EXPENDITURES ($ Millions)	MARKET SHARE (Percent)
1	IBM	$2,500	41%
2	DEC	$300	5%
3	Microsoft*	$190	3%
4	Hewlett-Packard	$150	2%
5=	Ashton-Tate	$120	2%
5=	Burroughs	$120	2%
5=	Cullinet	$120	2%
8	NCR	$115	2%
9	ADR	$110	2%
10=	Computer Assoc. Intersil	$105	2%
10=	Sperry	$105	2%

Total Systems Software Product Market = $6,100 Million.

Top 10 = 63% of Market.

*Includes distribution revenue for micro software.

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EXHIBIT III-7

SYSTEMS SOFTWARE PRODUCT LEADERS (NON-HARDWARE), 1985

RANK	COMPANY	USER EXPENDITURES ($ Millions)
1	Microsoft*	$190
2	Cullinet	$120
3	Ashton-Tate*	$120
4	ADR	$110
5	Computer Associates	$105
6	Pansophic	$60
7	Uccel	$55
8=	Candle	$50
8=	Cincom	$50
8=	Information Builders	$50
9	Software AG	$45
10	Sterling Software	$38

*Includes distribution revenue for micro software.

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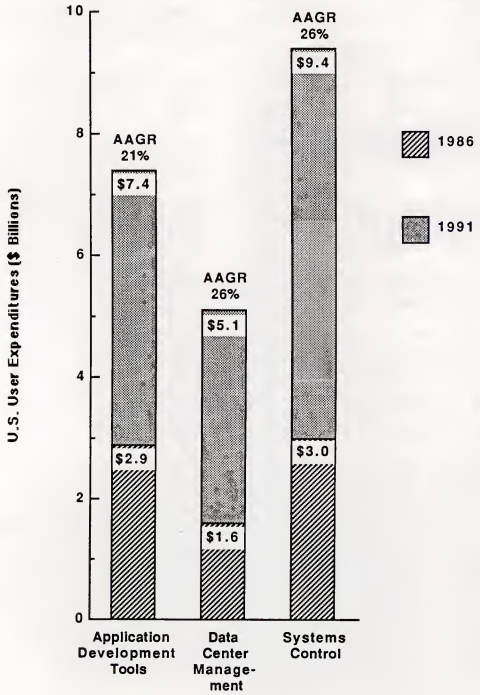
TOTAL SYSTEMS SOFTWARE MARKET BY SOFTWARE TYPE, 1986-1991



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D. APPLICATION DEVELOPMENT TOOLS (ADT)

- The application development tools segment of the systems software market includes:
  - DBMS.
  - Languages (including 4GL).
  - Data dictionaries.
  - Compilers.
  - Retrieval systems.
- The application development tool market will have the lowest 1986-1991 growth rate of all the systems software segments at 21% (see Exhibits III-9, III-10, and III-11). This percentage growth may, however, be deceiving in that the user expenditures in 1991 will be substantial ($7.4 billion).
  - Impediments to market growth are:
    - IBM's drive to make DB2 a standard has lengthened the selling cycle of large system DBMS products due to user confusion.
    - With the introduction of more capable micros, a lower-cost micro will be able to be purchased where once a higher-priced mainframe or mini product sufficed. This will, however, be a stimulus to the micro DBMS and tool market.

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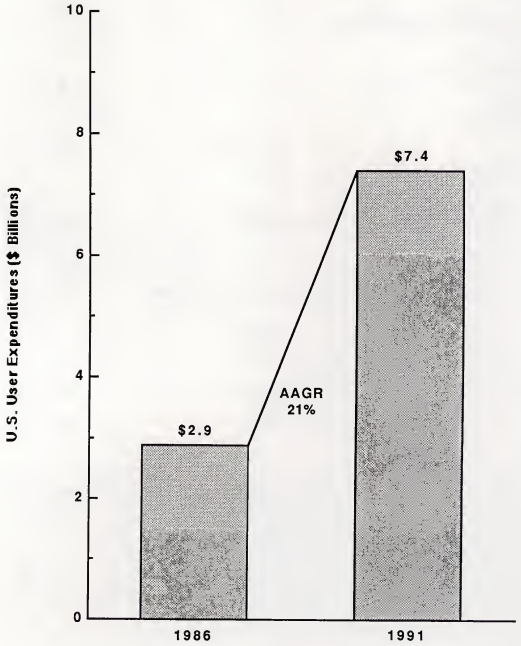
EXHIBIT III-9

APPLICATION DEVELOPMENT TOOLS, 1986-1991



MSPA-SSJz

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APPLICATION DEVELOPMENT TOOLS, 1986-1991
MAINFRAME/MINI-BASED

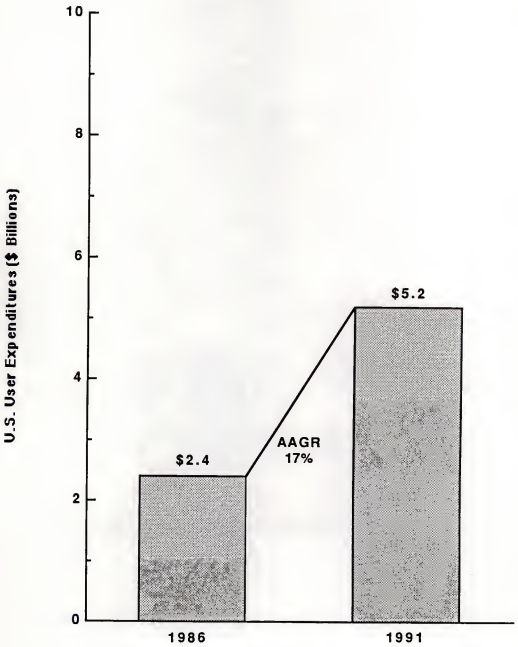

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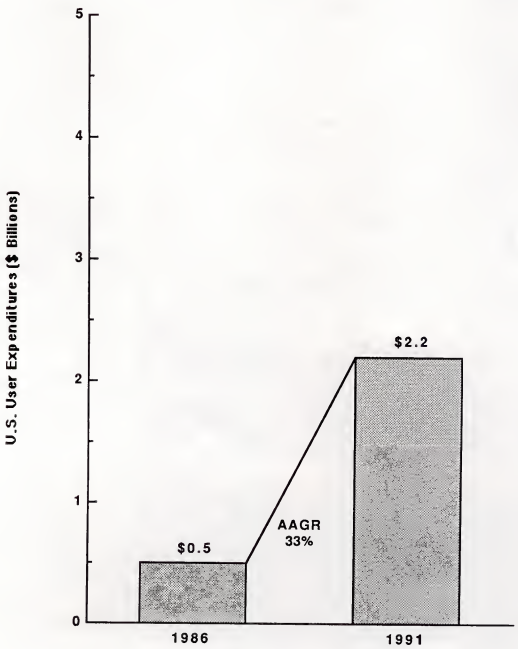
EXHIBIT III-11

APPLICATION DEVELOPMENT TOOLS, 1986-1991
MICROCOMPUTER-BASED



MSPA-SSJz

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- Stimulants to the market are:

  . The increase in the installed base of hardware that will need DBMS and tools.

  . End-user computing demand. End users will increasingly demand more tools to access information and create systems. They will realize that many off-the-shelf applications packages will not satisfy their specific needs and will resort to fourth generation languages either on hosts or on micros to build or rework programs.

  . Easier to use retrieval tools that will increase in popularity for nonprogrammers.

  . The desire for increases in user and programmer productivity that many ADTs are said to deliver.

- The major vendors in the application development tools market are listed in Chapter IV.

  - The leading vendor in this category is, again, IBM due to recurring revenues from IMS.

  - In 1985, most vendors had significant growth which has continued into 1986, specifically:

    . Pansophic (also a provider of SC products).

    . Computer Associates International.

    . Ashton-Tate.

    . Oracle.

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E. DATA CENTER MANAGEMENT (DCM)

- There are two broad types of data center management software products:
  - Products that optimize a machine's internal resources.
  - Products that help increase the productivity of the entire computer center.
- DCM products include such things as:
  - Capacity management.
  - Disk management (e.g., Sterling Software DMS/OS).
  - Performance monitoring (e.g., Goal Systems products).
  - Performance evaluation (e.g., CAI, JARS, UCCEL Express).
- The data center management (DCM) segment is expected to more than double within the forecast period (see Exhibits III-12, III-13, III-14).
  - Ninety-eight percent of the 1986 DCM market is for mainframe and mini-based products (2% micro products). As micros become more complex, interconnect, and utilize host data, the need to optimize the use of costly large host systems will continue to be a stimulant to the mainframe/mini DCM market throughout the forecast period.
  - The micro segment will experience significant growth (an AAGR of 80%), but this is primarily due to a low 1986 user expenditure base.

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DATA CENTER MANAGEMENT, 1986-1991

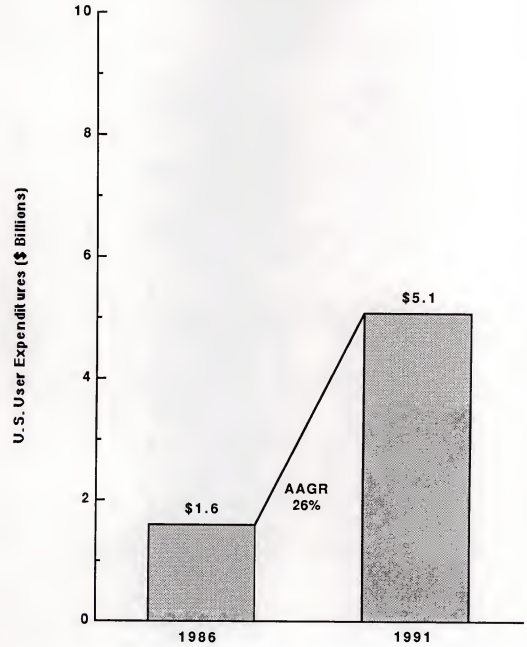

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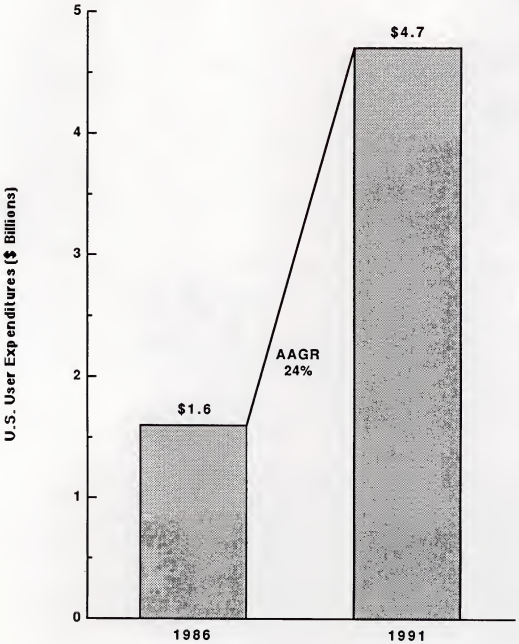
EXHIBIT III-13

DATA CENTER MANAGEMENT, 1986-1991
MAINFRAME/MINI-BASED



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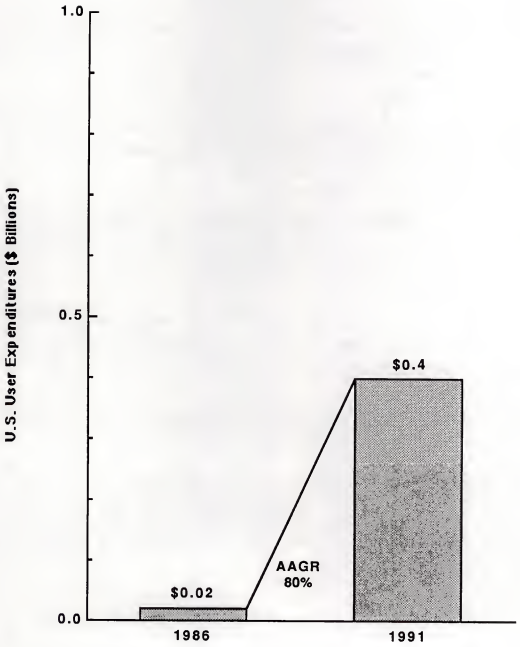
DATA CENTER MANAGEMENT, 1986-1991
MICROCOMPUTER-BASED



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- As micros become more complex and interconnect, firms will require additional overhead of software, services, and people to coordinate their use. This will help fuel data center management growth so that in 1991 micro software-related products will be 9% of total systems software user expenditures.

- Stimulants to the market include:

  - Economic conditions and confusion over buying options that decrease the purchasing of new systems and encourage the optimization of existing products.

  - Micros now costing $3,000 will in many cases be replaced within the forecast period by more sophisticated multiuser systems connected to terminals.

    - Consequently, management of these computing resources will become an issue. Individual departments within a corporation will become "mini" DP departments.

    - As LANs increase in importance, keeping track of files, scheduling, and backup will become major issues that data center management products address.

  - The evolution of the data center that puts the ability to access host data in the hands of nonprogrammers.

- Major vendors in this segment are again found in Chapter IV. Most vendors, such as VM Software, Duquesne Systems, and UCCEL, are expected to retain or increase market share due to quality products and name recognition.

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F. SYSTEMS CONTROL (SC)

1. OVERVIEW

- The systems control market includes such products as operating systems, communications software, and security packages--products that help direct, schedule, and/or control a computer's internal resources.

- In 1991, the systems control segment will account for over $9 billion in user expenditures as a result of a five-year 26% AAGR (see Exhibit III-15). This will make the systems control sector in 1991 one-third larger than the entire systems software market in 1986 ($7 billion).

  - In 1986, the mainframe/mini segment of this market accounted for 87% of the user expenditures. In 1990, the mainframe/mini share of the segment is expected to decrease to 80% of the market.

  - The increase in micro share can be attributed in most part to the micro shipments of systems with more functional and more expensive operating systems, as well as the incorporation of micro-mainframe links and LANs on new and existing micros.

  - Both the mainframe/mini and micro segments will have growth rates in excess of 20% throughout the forecast period (see Exhibits III-16 and III-17).

- Factors that serve to stimulate systems control growth include:

  - The drive toward connectivity that leads to increased sales of micro-mainframe (M-M) links and new security packages for three-tiered systems.

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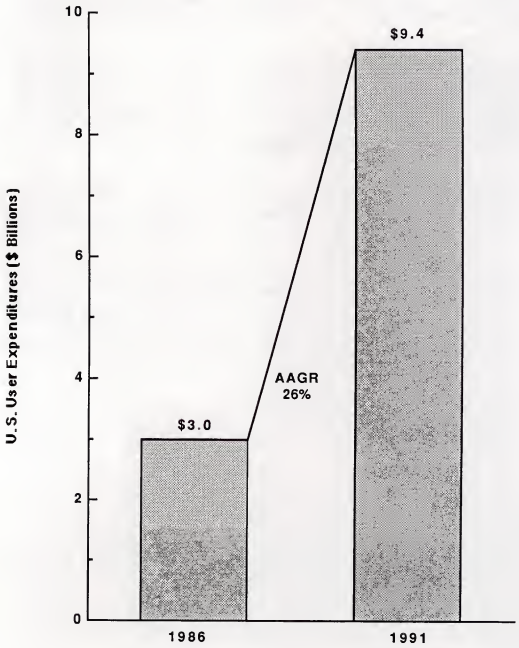
EXHIBIT III-15

SYSTEMS CONTROL, 1986-1991



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SYSTEMS CONTROL, 1986-1991
MAINFRAME/MINI-BASED

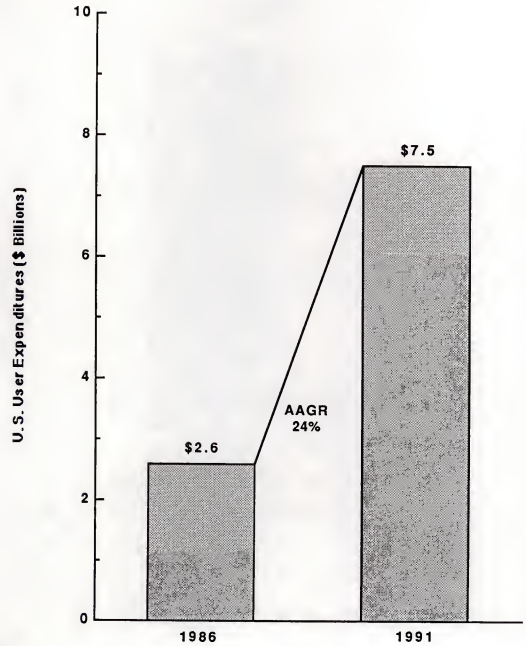

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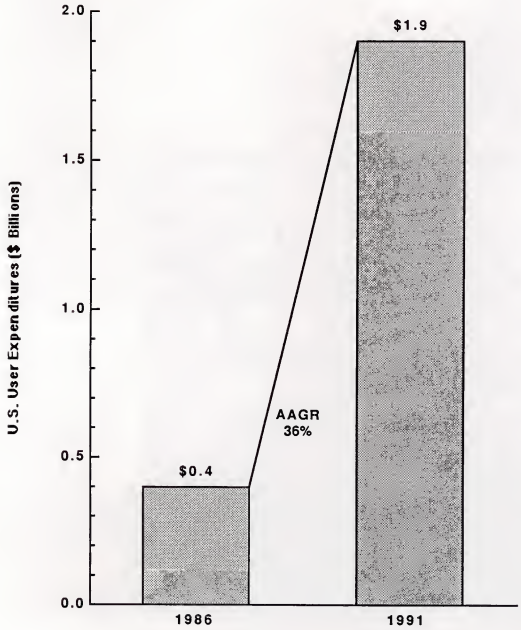
EXHIBIT III-17

SYSTEMS CONTROL, 1986-1991
MICROCOMPUTER-BASED



MSPA-SSJz

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- Sales of hardware systems, especially large systems with large licensing fees.

2. OPERATING SYSTEMS

- In order for the application software market to develop, an operating system (OS) standard must be available to serve as the foundation for families of software products. Knowing which OS will emerge as the dominant standard is therefore crucial.

  - On large systems, IBM's MVS/XA and VM will be the two major products.

  - On mid-range systems, DEC's VAX/VMS and IBM's VM and SSP will remain the leaders.

  - On the micro level, PC-DOS or MS-DOS will remain the leader with such other OSs as UNIX and VM gaining in favor with 80286 and 80386 machines. Multiuser, multitasking, shared-file, and interconnected personal processing are the new markets that await OS development.

3. MICRO-MAINFRAME LINKS

- Micro-mainframe links are increasing in importance to users as:

  - End-user computing continues with an increasing installed base of standalone micros in all departments

  - Standards evolve in M-M products.

- A 1986 INPUT survey found users estimating M-M importance increasing by an average of 60% over the next two years, a finding consistent with earlier research.

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- INPUT projects that there were over 350,000 M-M links installed in 1985 (direct connect via an emulation board versus by a modem). M-M links installed in 1991 will exceed three million.

4. LANS

- Personal computing is evolving beyond its original standalone role. The focus of the next wave of personal computers will be on connecting them, easing the process of getting information from the mainframe, and exchanging information. This can all occur over a local area network (LAN).

- Local area networks represent the obvious next step for large corporations to take to increase the productivity of end users and the computer systems that they use.

  - Companies are standardizing on hardware and software because any incompatibilities would hamper efforts to move users to LANs.

  - In many companies, the PC will emerge as a multipurpose terminal tied to departmental minicomputers which, in turn, will be tied to the corporate data base. In such a configuration, the PC would be used for spreadsheets and local data base work, yet have the transparent connections through information directories to departmental and corporate data. Either M-M links or LANs could be used in this scenario.

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IV COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The number of vendors in the systems software area continues to grow especially in the area of ADT (with tools and aids) and SC (with gateways, link products, and interfaces).
- In such well-established markets as DBMS and OS, significant penetration by unknown vendors is highly unlikely.
- Key vendors in each of the systems software segments follow. In several instances, vendors have products in more than one segment but are categorized by the segment where they receive the largest revenue.

B. VENDOR PROFILES

1. APPLICATION DEVELOPMENT TOOLS

a. Applied Data Research, Inc.

- Applied Data Research, Inc., Route 206 & Orchard Road, Princeton, NJ 08540.

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- Applied Data Research (ADR), founded in 1959, is engaged in the design, development, marketing, and support of systems software products primarily in the area of ADT. Specifically, ADR products include data base management (DATACOM/DB), application development (IDEAL), on-line programming (ROSCOE), office automation (ADR/EMAIL), decision support (EMPIRE), and performance measurement (ADR/LOOK).

- In January 1986, a regional Bell Operating Company, Ameritech (Chicago, IL), acquired ADR for $215 million, thus entering into the competitive computer services industry. Ameritech publicly announced its intention to operate ADR as a separate subsidiary under ADR's existing management, but less than a year later ADR president Martin Goetz voluntarily stepped aside. He was replaced by a former president of Ameritech Mobile Communications.

- In March 1986, ADR announced a change in pricing policy, reducing leasing rates of certain term leases. This was to reflect the expected long-term life of its software and to make term leasing economically attractive to clients. At the same time, ADR maintained the same permanent license prices for all products.

- In order to increase its presence in the personal computer software market, ADR signed a development agreement with Ashton-Tate. This agreement permitted direct information exchange between ADR's Datacom/DB mainframe data base management system and Ashton-Tate's dBASE and Framework packages, both working through ADR's PC Datacom.

- In response to the trend toward distributed or departmental processing, ADR has declared its intent to focus new product development on the LAN market as opposed to the DEC market as most of its third-party DBMS competitors have chosen to do.

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b. Cullinet Software, Inc.

- Cullinet Software, Inc., 400 Blue Hill Drive, Westwood, MA 02020.

- Cullinet Software, Inc. develops, markets, and supports software primarily in the areas of:

  - DBMS and tools.

  - Applications software for manufacturing, banking and finance, and human resources.

- The foundation of Cullinet's software line is its Integrated Database Management System (IDMS) and its relational counterpart (IDMS/R). Seventy-two percent of the company's revenue revolves around this data base product line. A rapidly growing area of the company's business is information center software, such as Cullinet's Information Center Management System (ICMS) which provides customers with the means to access and analyze mainframe-resident corporate information through their personal computers. Information center software products accounted for 9% of Cullinet's 1986 revenue. The remaining 19% was divided between various applications software packages.

- Cullinet sales were essentially flat between fiscal 1985 and 1986 after a previous growth of 53% (1984-1985). Cullinet attributed this to an overall slowdown in the growth of the software industry along with significantly reduced capital spending on the part of its prospective customers. Pricing changes within the overall DBMS market also contributed to the flat growth, particularly the increased acceptance of IBM's competitively-priced DB2 product and ADR's decision to emphasize lower-priced leased software.

- In early 1986, major management changes occurred. New management has since focused Cullinet to take a number of steps to improve the revenue outlook of fiscal year 1987. Cullinet acquired two minicomputer software

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companies, ESVEL, Inc. of San Jose (CA) and Computer Strategies, Inc. of Grand Rapids (MI). ESVEL offers a data base management system for 32-bit minicomputers systems such as the DEC VAX line as well as competitive systems from Honeywell, Hewlett-Packard, and Data General. Computer Strategies markets software for manufacturing industries using DEC VAX and other minicomputer systems. These acquisitions signal a strong thrust by Cullinet into the high-growth VAX market.

- In August 1986, Cullinet announced that it would provide some level of support for IBM's SQL in its products. While announcing support of the SQL standard, Cullinet was quick to add that it would not provide support for the competing DB2 product.

c. Software AG Systems, Inc.

- Software AG Systems, Inc., 11800 Sunrise Valley Drive, Reston, VA 22091.

- Software AG Systems, Inc. (Software AG) develops, markets, and supports an integrated line of systems software products, specializing in data base management systems (DBMS) and application development tools.

- Fiscal 1985 revenue was $52 million, a 27% increase over 1984. Software AG management attributes revenue increases principally to a greater volume of licenses for its products. Declines in net income during fiscal 1985 of 12% resulted from a change in the method of accounting for contract revenue. The new policy is to recognize revenue at the time the product is installed as opposed to its former policy which had been to recognize 90% of the revenue at contract execution and the remaining 10% at installation. The company's primary products for IBM mainframes, ADABASE (DBMS) and NATURAL (4GL), account for the vast majority of yearly revenue.

- In 1986, Software AG announced its intention to have NATURAL support for DB2. The product already supports the DEC VAX line.

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- Software AG has joint agreements with numerous applications software vendors to:

  - Develop new applications software products around Software AG products.

  - Integrate Software AG products into existing applications.

  - Provide interface capabilities that permit Software AG products to be used with existing applications.

d. Cincom Systems, Inc.

- Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, OH 45211.

- Cincom provides data base management, data communications, and related systems software; applications software; and associated educational and support services to over 7,000 clients.

- Fiscal 1985 revenue reached $92 million, an 8% increase over fiscal 1984 revenue of $85 million. Cincom expects a 25% growth rate for fiscal 1986.

- Revenue for fiscal 1985 was derived from the following sources:

Total Information System (TIS)	28%
TOTAL	25
MANTIS	22
ULTRA	4

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NET/MASTER	3
Other systems software products	8
Applications software products	10
	100%

- Cincom's products include:

  - SUPRA, introduced in 1985, the replacement product for Cincom's Total Information System (TIS). SUPRA is an advanced relational data base management system for the IBM mainframe environment.

  - TIS (SUPRAS's predecessor product), an integrated data base system designed for the high-volume data processing environment. TIS was installed at 275 sites as of October 1985. ULTRA is the DEC VAX version of TIS.

  - The TOTAL Data Base Management System, with data independent and structuring capabilities that allow users to develop applications on a modular basis.

  - MANTIS, an on-line application development system and programming language using structured coding and top-down design techniques.

e. Computer Associates International, Inc.

- Computer Associates International, Inc., Computer Associates Building, 125 Jericho Turnpike, Jericho, NY 11753.

- Computer Associates International, Inc. (CAI) designs, develops, markets, and supports systems, data base management, and applications software products for mainframes, minicomputers, and microcomputers.

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- The company's primary systems software products include CA-DYNAM, CA-OPTIMIZER, CA-SORT, and CA-UNIVERSE.

  - The CA-DYNAM/CMS tape management family was introduced in June 1983. The products consist of a VM/CMS version of CAI's CA-DYNAM/T tape management system and CA-DYNAM/B, a flexible backup and restore facility for the VM/CMS environment.

  - CA-OPTIMIZER and CA-SORT are a code optimizer and sort package, respectively.

  - CA-UNIVERSE, introduced in April 1983, is a relational data base management system written in the C language and transportable across various vendors' hardware.

- CAI entered the microcomputer applications software market as a result of its June 1983 acquisition of Information Unlimited Software (IUS) and Sorcim and has continued to be very aggressive with acquisitions (Software International and ISSCO) in 1986.

f. Ashton-Tate

- Ashton-Tate, 20101 Hamilton Avenue, Torrance, CA 90502.

- Ashton-Tate develops, markets, and supports data base management, word processing, integrated, and graphics software for microcomputers.

- Fiscal 1986 revenue reached $122 million, a 48% increase over 1985. Net income for the same year increased 122%.

- In 1986, Ashton-Tate introduced a LAN version of its popular dBASE product and has announced its intentions of entering the mainframe software market sometime in the near future.

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g. Oracle Systems Corporation

- Oracle Systems Corporation, 20 Davis Drive, Belmont, CA 94002.

- Oracle develops and markets data base management, applications development, and decision support software products.

- In March 1986, Oracle made an initial public offering of 2.1 million shares of Oracle common stock. One million shares were offered by Oracle Systems Corporation and the remaining 1.1 million shares by selling shareholders. Net proceeds of approximately $14 million will be used for repayment of notes payable and for general corporate purposes, including continued product development and possible acquisitions of related businesses or software products.

- Oracle's principal product is the ORACLE relational data base management system. ORACLE allows users to define, retrieve, manipulate, and control data stored in a computer using the IBM compatible SQL nonprocedural language.

- ORACLE was designed and written to make it adaptable or portable to most computer hardware and operating systems, specifically MVS, VM, VMS, PC-DOS, and UNIX. This portability allows customers to use the same data base management software and user interface on all their machines. ORACLE has been ported to a variety of microcomputers, minicomputers, and mainframes. The price for a microcomputer version ranges from $1,000 to $24,000. A minicomputer or mainframe version ranges in price from $12,000 to $160,000.

- In late 1986, Oracle announced SGL Star, a distributed relational (DBMS), as well as a menu interface for novice users called EASY.

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h. Relational Technology, Inc.

- Relational Technology, Inc., 2855 Telegraph Avenue, Berkeley, CA 94705.

- Relational Technology, Inc. (RTI), founded in 1980, develops and markets relational data base management systems software and related utility packages.

- RTI's primary software product was originally developed by computer scientists at U.C. Berkeley in the early 1970s. The founders of RTI acquired the commercial licensing rights in 1980 and developed an enhanced commercial version called INGRES.

- Since then, RTI has announced a DDBMS to be shipped in early 1987.

i. Pansophic Systems, Inc.

- Pansophic Systems, Inc., 709 Enterprise Drive, Oak Brook, IL 60521.

- Pansophic Systems, Inc., founded in 1969, develops, markets, and supports standardized computer applications development software products. The company's primary products are EASYTRIEVE-PLUS, which facilitates the retrieval of data stored in computer systems; PANVALET and PAN EXEC, which store and protect software program libraries; and GENER/OL and TELON, which facilitate computer applications development.

- Pansophic's product line includes:

  - EASYTRIEVE (data retrieval tool) - 50% of 1985 revenue.

  - PANVALET (library control system) - 30% of 1985 revenue.

  - TELON, GENER/OL (development tools) - 20% of 1985 revenue.

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- Pan-link (micro-mainframe link).

- Ingot (DSS acquired in February 1986).

- D-Pict (graphics acquired in January 1986).

- SPSS (DSS company acquired in November 1986).

- Noting the above list, it is apparent that Pansophic is actively increasing its product offerings by aquisitions of products as well as companies. They are forming a separate sales organization to sell their applications products.

- Pansophic's 1985 revenue in 1986 (April) was $80 million. Projected revenue for 1987 is over $100 million.

- Pansophic has also been active in acquiring software companies. For example, Pansophic acquired the graphics division of British Petroleum PLC's data plotting services unit in January 1986, and in August 1986, Pansophic signed a letter of intent to acquire Fusion Products International, Inc., a developer of information retrieval and report writing systems, for $7.2 million in stock. Also, Pansophic recently purchased SPSS, Inc.'s statistical software package for service demographics.

- The fact that Pansophic is targeting "all segments of the business computing environment" may be overextending resources and expertise too far outside the market where they are known and respected.

- In late calendar 1985, Pansophic had a major sales reorganization and started a telemarketing group. This was to combat decreasing U.S. sales (international sales remained strong). In January 1986, the company increased the price on maintenance of products by 25%.

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- Pansophic was extremely active in 1986, reinvesting revenue into the company's future in both product development (almost $10 million) and product marketing (developing an extensive in-house training and development program for its sales and marketing personnel and its independent marketing representatives).

2. DATA CENTER MANAGEMENT

a. VM Software, Inc.

- VM Software, Inc., 2070 Chain Bridge Road, Suite 355, Vienna, VA 22180.

- VM Software, Inc., founded in 1981, develops, markets, and supports systems software products for IBM's VM operating environment.

- VM Software markets a family of standard system software products for use with IBM's VM operating system that are designed to enhance the control, productivity, and security of a customer's data processing resources. The family consists of seven individual products which can be licensed separately or as an integrated product called VMCENTER T.M.

- 1985 net revenue reached $18 million, a 62% increase over $11.1 million for 1984. Net income rose 74%, from $1.8 million in 1984 to $3.1 million in 1985. In 1986 revenue is expected to increase by 50%.

- VM Software management attributes revenue growth primarily to the increase in unit product licenses, the introduction of new products and new releases of existing products, general price increases, and a decrease in the level of product returns.

- In May 1985, VM Software made an initial public offering of almost two million shares. Funds raised will be used to repay debts and for general corporate purposes, including working capital and possible acquisitions.

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- In March 1985, VM Software entered into an agreement with IBM granting to IBM a ten-year, worldwide, nonexclusive right to license VM Software's VMBACKUP, VMARCHIVE, and VMTAPE systems software packages. In 1985, VM Software recorded $575,000 in revenue under this marketing agreement with IBM. In third quarter 1985, IBM corporate purchased a significant amount of product for internal use but resold very little.

- In early 1986 the company introduced:

  - VM Batch - improves VM in doing batch-like functions.

  - VM Operator - whereby an operator needs fewer functions to run VM.

  - VM Monitor - for capacity planning and performance monitoring.

- In the near future, the company will be developing products to fill the functionality holes of SQL.

b. Duquesne Systems, Inc.

- Duquesne Systems, Inc., Two Allegheny Center, Pittsburgh, PA 15212.

- Duquesne Systems, Inc. (DSI), founded in 1970, provides systems software products for computer performance management and capacity planning.

- Revenue for fiscal 1985 increased 49% to $11.1 million from $7.5 million in fiscal 1984. Net income for the year increased 58% to $2.4 million from $1.5 million the previous year.

- DSI's system productivity enhancement software products are designed to run on IBM and compatible mainframes under MVS. There are currently over 3,500 product installations in over 1,200 computer sites worldwide.

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- DSI's product line consists of five distinct product groups:
  - Performance Management Facilities (PMF).
  - Shared Service Management (Shared Device Management).
  - Dynamic Performance Optimization (DPO).
  - System Utilities (SYSLOG, JOBLOG).
  - Terminal Productivity Executive (TPX).

c. Candle Corporation

- Candle Corporation, 10880 Wilshire Boulevard, Los Angeles, CA 90024.
- Candle Corporation, founded as a privately held corporation in 1977, develops, markets, and supports performance monitoring systems software products for IBM and plug-compatible mainframes. Candle's first (and major) product, OMEGAMON, is currently installed in over 3500 different sites worldwide.
- Candle is broken down into two divisions, the Computer Services Division, which develops, markets, and supports Candle's proprietary performance monitoring software products, and the Information Services Division, which develops software products for office automation and electronic mail systems.

d. Boole & Babbage

- Boole & Babbage, 510 Oakmead Parkway, Sunnyvale, CA 94086.
- Boole & Babbage, Inc., founded in 1967, designs, markets, and supports packaged software products and related services.

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- Boole & Babbage's software products can be classified into two broad categories--performance management and capacity management. The major market for the company's products are IBM systems using MVS and MVS/XA operating systems with or without IMS as a subsystem.

- Most of Boole & Babbage's products are included within its Information Resources Planning and Control (IRP) framework, a family of performance and capacity management products which collectively provide data extraction, data base management, analysis and monitoring, and planning and modeling capabilities. There are at least 17 distinct modules that can be added separately to form a complete integrated system.

- Boole & Babbage did not perform well financially in fiscal 1985. Changes in MVS and IMS required significant (and costly) changes in IRP products.

- More recently, Boole & Babbage sales have rebounded, with fiscal year 1986 revenues increasing 21% over 1985 ($28 million) and fiscal 1986 income at $1 million up from a loss of almost $6 million in 1985. A slowly improving economic environment, along with increased sales of VM systems, has combined to provide optimism by the company for continued improved sales.

e. UCCEL Corporation

- UCCEL Corporation, UCCEL Tower, Exchange Park, 6303 Forest Park, Dallas, TX 75235-5499,

- UCCEL provides systems software and financial management applications software products for IBM and compatible mainframes.

- Through 1985 UCCEL provided systems and applications software products, processing services, and turnkey systems worldwide. During early 1986 the company sold off its domestic and international processing services businesses

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and its mainframe commercial applications (cross-industry) software product line.

- UCCEL's 1985 revenue was $204.7 million.

- UCCEL has become very aggressive with acquisitions recently. Several major acquisitions include:

  - In December 1985, UCCEL acquired the operating environment conversion software product and support business (Conversions, Inc.) of Rand Information Systems, Inc. The acquisition included Rand's EXITDOS and TRANSIT products.

  - Corodale was also acquired in mid-1985. Corodale, a vendor of IBM DOS/VSE systems software for tape and disk management and job scheduling, now operates as UCCEL VSE & Conversion Systems within UCCEL's Systems Software Group.

- The company has also begun a diversification campaign to focus the company as highlighted below:

  - In December 1985, UCCEL sold its domestic Dallas-based processing services to Babcock & Wilcox Company for $4.8 million.

  - In January 1986, UCCEL sold its mainframe commercial applications software product line to Global Software, Inc. for $3.1 million. The sale included cross-industry products for accounts receivable, fixed assets, accounts payable, and tax applications.

  - In April 1986, UCCEL sold its Computer Integrated Manufacturing Company (CIMCO) subsidiary to Automated Industrial Systems, Inc. of Austin (TX).

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- During August 1986, UCCEL announced it had signed a letter of intent to sell its Open Systems, Inc. microcomputer software subsidiary and Digital Systems turnkey system division to Convergent Technologies for $28.5 million.

- UCCEL has restructured its operations into three primary business units, as follows:

  - The Systems Software Group is composed of North America and International Software Divisions, UCCEL Express Software, and UCCEL VSE and Conversions Systems.

  - The Financial Systems Division provides applications software products to the banking and thrift industries.

  - The Micro and Turnkey Group includes the operations of Open Systems, Digital Systems, and Spectrum Training Corporation, a provider of computer-based training products and services.

- Approximately 60% of UCCEL's 1985 revenue was derived from software products, 31% from remote computing services and other professional services, and 9% from minicomputer-based turnkey systems.

3. SYSTEMS CONTROL

   a. Microsoft Corporation

- Microsoft Corporation, 16011 N.E. 36th, Redmond, WA 98073-9717.

- Microsoft designs, manufactures, and markets microcomputer systems and applications software.

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- The company is the provider of the PC-DOS OS to IBM. They also market Xenix, a multiuser OS based on UNIX.

- Fiscal 1985 revenue reached $140.4 million, a 44% increase over $97.5 million reported for fiscal 1984.

- In February 1986, the company sold 2.5 million shares of Microsoft common stock on the over-the-counter exchange. The company's proceeds from the sale will be used for general corporate purposes, primarily working capital, product development, and capital expenditures.

- Approximately 92% of Microsoft's fiscal 1985 revenue was derived from software products (54% systems software and 38% applications software). The remaining 8% of revenue was derived from hardware and book sales.

b. On-Line Software International, Inc.

- On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, NJ 07024.

- On-Line Software International was founded in 1969 as a software consulting company specializing in large-scale data base and data communications systems. Currently, 65% of On-Line Software's revenue is derived from systems software products designed for IBM mainframe users. The company also offers CICS, IMS, VSAM, and VTAM courses and publishes reference handbooks relating to CICS, IMS, and VTAM software.

- Fiscal 1985 revenue reached $29 million, a 12% increase over fiscal 1984 revenue of $25.9 million. Net income was $871,000 compared to a net loss of $836,000 in fiscal 1984.

- On-Line Software management attributes the company's return to profitability in fiscal 1985 to the following factors:

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- The continuation of a cost control program first implemented in late fiscal 1984.

- Substantial completion of product development efforts initiated in fiscal 1983 and fiscal 1984, which provided the ability to realize revenue from the license of these products in 1985.

- The introduction of a new product, VERIFY T.M., an automated quality control software product.

- Expansion of existing products into new areas of operation.

- During fiscal 1985, On-Line Software acquired two CICS security software packages. SECURE/CICS was acquired from Boole & Babbage, Inc., and COSS was acquired from Oxford Software, Inc.

- In December 1984, On-Line Software acquired CICS/TCA T.M., a programming tool, from D.A. Brask Systems, Inc. VERIFY, On-Line Software's automated quality control testing tool, introduced in April 1985, is based on CICS/TCA.

c. Sterling Software, Inc.

- Sterling Software, Inc., 8080 North Central Expressway, Suite 1140, Dallas, TX 75206.

- Sterling Software, through its wholly-owned subsidiaries, acquires, develops, markets, and supports a broad range of systems and applications software products and professional services. The company was incorporated in February 1983 and has successfully followed a strategy of software revenue growth through its decentralized subsidiaries. The company is organized into six operating groups:

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- Systems Software Group.
- Federal Systems Group.
- Professional Services Group.
- Information Services Group.
- Financial Software Group.
- Business Management Group.

- The company was started in 1981 by a group of investors whose strategy was to acquire companies that were specialists in key markets and vertical niches and to allow these specialists a free hand in developing and growing these organizations. Sterling was to provide financial and market assistance, but each operating company was allowed full independence in all areas of their companies, from product development to the setting of product pricing and support policies.

- In August 1985, Sterling acquired Informatics General Corporation for $126 million. This acquisition increased Sterling from a $19 million company to a $236 million company. While some analysts have questioned the acquistion from the standpoint of debt and the risks involved in the IBM mainframe software market, Sterling officials felt that Informatics was present in markets that Sterling should either enter or increase their presence in. In addition, Informatics is a clearly recognizable name in the industry.

- Sterling has moved quickly to blend Informatics into the company. The company cut $20 million in corporate overhead, primarily through management firings. And to further lessen the debt incurred by buying Informatics, Sterling began a divestiture program that involved the sale of four divisions.

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- Pacesetter Systems (to Shared Financial Systems of Dallas).

- Management Control Systems (to Simon & Schuster of New York).

- Legal Systems (to Baron Data Systems of San Leandro, CA).

- The company has not announced the fourth division targeted for divestiture.

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V CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

- The systems software market in 1985 was one of the healthiest segments of the information services industry. It had a 23% growth from 1984-1985 as opposed to the overall information services market that had a 17% growth. It will continue from 1986-1991 with a 24% AAGR

- There are inherent characteristics in most systems software products that contributed to that growth. Most of these characteristics capitalized on the tightening in the U.S. ecomony which created the desire to make existing computer center resources more efficient.

- IBM will continue to be the major competitor in the systems software market with over 40% market share in 1985, primarily from OS licenses. There will, however, continue to be opportunities for vendors of products that enhance or complement IBM hardware, OS, and DBMS products.

- The ADT market will have a 21% AAGR throughout the forecast period, becoming a $7 billion opportunity by 1991. Spurring this growth will be:

  - The growing installed base of hardware systems that will be able to utilize DBMS and tools.

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- Increases in end-user computing that stimulate the need for easy to use ADT products and RDBMS.

- Technological changes that will make the above mentioned "easier" ADT and RDBMS possible.

- The DCM market will have a 26% AAGR, higher than ADT but beginning from a smaller base. The need to optimize the efficiency of computer resources as well as personnel will be the primary driving forces in this segment.

- In 1991, the systems control segment will account for over $9 billion in user expenditures as a result of a five-year 26% AAGR. This will make the systems control sector in 1991 one-third larger than the entire systems software market in 1986 ($7 billion).

  - Recurring revenue from OS licenses by major hardware vendors will be the major area of growth.

  - LANs, M-M links, and security packages will also experience healthy growth due to the drive toward connectivity.

B. RECOMMENDATIONS

- To take advantage of the opportunities available in the systems software marketplace, vendors should:

  - Integrate product lines. Systems should be designed so they can be easily integrated with related applications either now or later.

  - Spend more effort tracking and evaluating new technology. Technology will continue to be a major factor in product differentiation, and consequently, its creative use will be a key to vendor success.

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- Be more aggressive internally with the use of systems development tools that can enhance the productivity of R&D efforts.

- Evaluate alternate distribution channels, such as subcontracting to system integration vendors who win large contracts for acquiring, combining, and installing complex hardware/software systems.

- Emphasize customer service. Post-sales support is a major opportunity for vendors to acquire a predictable annual revenue stream as well as better satisfy customers who will then return for future products.

- Be on the lookout for partners. Aggressively seek partnering activities, be they acquisitions, joint ventures, or R&D partners. This will help increase chances for sales opportunities, especially in markets where the window of opportunity is narrow.

- Focus on recurring revenues. Place more emphasis on monthly rather than up-front, one-time payments. This increases vendor financial stability plus helps stimulate sales to buyers with short-term budget pressures.

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VI DATA BASE AND RECONCILIATION

- INPUT's data base of market forecasts for the system software market is contained in Exhibit VI-1.

A. 1985 MARKET

- A reconciliation between systems software market forecasts made by INPUT in 1985 compared with the 1986-1991 forecasts made in this report shows similar base year (1985) numbers (see Exhibit VI-2).

- This reflects the overall stability of the systems software market as compared to other information service market segments.

- There are, however, significant changes in several of the segments within the market:

  - The mainframe/mini segments of ADT and DCM decreased 13% and 11%, respectively, from the 1985 to the 1986 forecast. This was due to the overall softness in the information services industry encountered late in 1985, after INPUT's forecast for the year had been formalized.

  - The systems control segment for mainframe/mini was raised by 10% in this year's forecast due to an increase in MVS/XA sales for 3090 products that were shipped at year end.

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EXHIBIT VI-1

SYSTEMS SOFTWARE USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1991

SEGMENTATION BY DELIVERY MODE	1985 ($ M)	1985-1986 GROWTH	1986 ($ M)	1987 ($ M)	1988 ($ M)	1989 ($ M)	1990 ($ M)	1991 ($ M)	AAGR 1986-1991
Application Development Tools									
Mainframe/Mini	$2,100	12%	$2,352	$2,530	$2,985	$3,582	$4,370	$5,200	17%
Micro	$390	36%	$530	$760	$1,005	$1,301	$1,690	$2,210	33%
Total Application Develop. Tools	$2,490	16%	$2,882	$3,290	$3,990	$4,883	$6,060	$7,410	21%
Systems Control									
Mainframe/Mini	$2,000	30%	$2,600	$3,206	$3,688	$4,185	$5,106	$7,520	24%
Micro	$325	26%	$408	$549	$795	$1,101	$1,395	$1,892	36%
Total Systems Control	$2,325	29%	$3,008	$3,755	$4,483	$5,286	$6,501	$9,412	26%
Data Center Management									
Mainframe/Mini	$1,250	27%	$1,588	$2,040	$2,519	$3,145	$4,025	$4,700	24%
Micro	$20	15%	$23	$43	$72	$135	$240	$440	80%
Total Data Center Management	$1,270	27%	$1,611	$2,083	$2,591	$3,280	$4,265	$5,140	26%
Total Mainframe/Mini	$5,350	22%	$6,540	$7,776	$9,192	$10,912	$13,501	$17,420	22%
Total Microcomputer	$735	31%	$961	$1,352	$1,872	$2,537	$3,325	$4,542	36%
Grand Total	$6,085	23%	$7,501	$9,128	$11,064	$13,449	$16,826	$21,962	24%

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EXHIBIT VI-2

SYSTEMS SOFTWARE DATA BASE RECONCILIATION

DELIVERY MODE	1985 FORE-CAST ($ M)	1986 REPORT ($ M)	VARIANCE AS PERCENT OF 1986 REPORT	1985 FORE-CAST ($ M)	1986 FORE-CAST ($ M)	VARIANCE AS PERCENT OF 1986 FORECAST	1985-1990 AAGR FORECAST IN 1985 REPORT (%)	1986-1991 AAGR FORECAST IN 1986 REPORT (%)
Application Development Tools								
Mainframe/Mini	$2,383	$2,100	13%	$7,917	$4,370	81%	27%	17%
Micro	$402	$390	3%	$2,394	$1,690	42%	43%	33%
Total Application Develop. Tools	$2,785	$2,490	12%	$10,311	$6,060	70%	30%	21%
Systems Control								
Mainframe/Mini	$1,800	$2,000	-10%	$4,613	$5,106	-10%	21%	24%
Micro	$337	$325	4%	$1,489	$1,395	7%	35%	36%
Total Systems Control	$2,137	$2,325	-8%	$6,102	$6,501	-6%	23%	26%
Data Center Management								
Mainframe/Mini	$1,386	$1,250	11%	$3,010	$4,025	-25%	17%	24%
Micro	$14	$20	-30%	$228	$240	-5%	75%	80%
Total Data Center Management	$1,400	$1,270	10%	$3,238	$4,265	-24%	18%	26%
Total Mainframe/Mini	$5,569	$5,350	4%	$15,540	$13,501	15%	23%	22%
Total Microcomputer	$753	$735	2%	$4,111	$3,325	24%	40%	36%
Grand Total	$6,322	$6,085	4%	$19,651	$16,826	17%	25%	24%

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- The DCM segment for micros increased by 30%, but considering the small base number, the change is insignificant.

B. 1990 MARKET

- The 1990 forecasts changed due to a decrease in the overall projected growth rate for the systems software market. The lowered growth rate caused 1990 user expenditures to be less in the 1986 forecast than in the 1985 forecast.

- The growth rates reflected the impact of the economic and corporate issues elaborated on in the preceding text.

  - The ADT segment growth rate was decreased due to ecomonic tightness and user confusion.

  - The DCM segment was increased due to user desire for increased productivity of people and computer resources.

  - The systems control market remained similar in growth rate and 1990 user expenditures in both the 1985 and 1986 forecasts.

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
VALUE-ADDED NETWORKS SECTOR

DECEMBER 1986

U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
VALUE-ADDED NETWORKS SECTOR

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
VALUE-ADDED NETWORKS SECTOR

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I MARKET SIZE AND GROWTH

- Value-added networks (VANs) are publicly available data carriers which augment basic network transmission with computerized (usually packet) switching and other features. These features include:

  - Protocol and speed conversion, permitting dissimilar devices to exchange data.

  - Error detection/correction.

  - Store and forwarding.

  - Host computer interfacing.

- VANs are available on a dial-up basis, or a customer may be directly connected through a leased line to a network node.

- In 1986, the market for value-added network services grew 33% over 1985, with user expenditures for VAN services reaching $409 million. From this level growth will continue based on an average annual growth rate (AAGR) of 28% through the forecast period to 1991, as shown in Exhibit I-1.

- Due to continuing price competition for these commodity services, traffic volumes are growing at a higher rate than revenue and, for some vendors, profitability has remained elusive.

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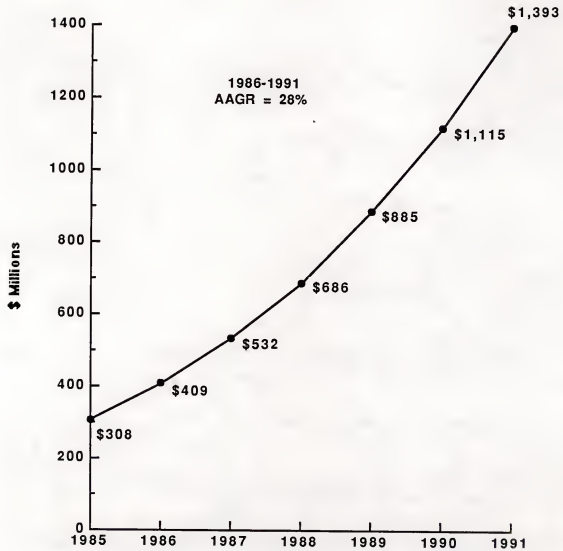
EXHIBIT I-1

VALUE-ADDED NETWORKS MARKET GROWTH
(Noncaptive - Services Only)



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- Transaction applications such as electronic data interchange (EDI), point of sale (POS), and check verification/authorization networks are driving VAN growth, with electronic mail (E-mail) and on-line data base (OLDB) access close behind.

  - EDI usage is embryonic, creating an estimated $48 million 1986 market for communications, processing, software, and professional services, doubling 1985's market.

  - E-mail use will increase as standards acceptance (principally X.400) leads to system interconnectivity and more utility.

  - OLDB will grow throughout the forecast period; however, long-term (and beyond the forecast period), OLDB-related VAN activities will see some erosion due to emerging CD ROM data bases.

  - VAN vendor activities in support of private networks for automatic teller machine (ATM), point of sale (POS) networks, and other applications will contribute to VAN growth.

- In several ways, competition is both increasing and decreasing.

  - Existing VANs continue to be attacked from the high end by hardware vendors selling packet switching equipment for private networks, leading to substantial cost savings for high-volume users.

  - While VANs provide facilities and often equipment for private and virtual private networks, such sales essentially result in revenue losses as they are sacrificial in nature.

- Competition and cooperation are increasing as a result of local exchange carrier (LEC) activities and the nature of value-added communications.

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- Local packet networks are being implemented, and Southern New England Telephone's ConnNet interconnects with both Tymnet and ITT's World Communications.

- When and where available, LEC-provided local area data transport (LADT) packet services will be less expensive than existing VAN services.

  . LADTs offer asynchronous to X.25 protocol conversion services.

  . LADTs are targetting the approximately 5% of VAN traffic which stays within the local area.

  . However, with long-haul connections, LADT services will participate in traditional VAN markets and provide additional access points for existing vendors which interconnect to them.

- Cooperation is found in the industry with VANs interconnected to a degree, allowing users of one network to access customers and applications on another.

• Competition is decreasing as industry consolidation continues:

  - Telenet and Uninet have joined as part of the new U.S. Sprint, jointly owned by GTE and United Telecom, forming Telenet Communications Corporation.

  - AT&T's Net 1000 has been cancelled.

  - CompuServe has made known its desire to acquire companies which can contribute to its current directions.

• More industry consolidation is likely to come in the form of mergers or joint ventures.

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II ISSUES, TRENDS, AND EVENTS

- As noted, 1986 saw the merger of Telenet and Uninet, thus solidifying Telenet's market lead.

- In early 1987, General Electric announced it was selling the Cylix value-added network which it acquired in the merger with RCA.

  - The VAN originated in 1969 as part of Data Communications Corporation (Memphis, TN).

  - Cylix was purchased by RCA for over $30 million in 1982. It has never been profitable.

  - The new buyers are members of Cylix management. Terms were not disclosed.

- AT&T's Net 1000 was withdrawn, but pieces of the organization and the experience gained form the basis for possible reintroduction.

  - Net 1000 technology is the basis of initiatives overseas, principally in Japan.

  - AT&T's Accunet Packet Services provide multiprotocol support through a joint offering (called RediAccess) with Control Data Corporation (CDC) which provides conversions and packet assembly/disassembly services. Accunet is used for CDC's Redinet EDI service.

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- 1986 included a demoralizing, and unfounded, rumor that McDonnell Douglas' Tymnet was for sale, with British Telecom the alleged suitor.

- British Telecom did buy ITT's Dialcom, creating uncertainty about that unit's continued ability to participate in U.S. government markets given its new foreign ownership.

- There have been examples of creative pricing and new services designed to increase network traffic:

  - Telenet's PC Pursuit offers hobbyists unlimited off-peak usage for a flat $25 monthly fee.

  - GEISCO's GEnie provides access to a variety of bulletin boards for $5 per hour off-peak, competing with existing hobbyist services such as the Source, CompuServe, and Delphi.

  - IBM's pricing has been restructured to become more competitive, with reductions in charges for connect time.

  - GEISCO has signed agreements with vertical market specialists in the automotive and apparel industries to sell EDI services along with turnkey systems and software.

- But 1986 did not bode well for videotex services. All three public systems (in Chicago, Florida, and Southern California) abandoned operations. The only interesting videotex development is the availability of the French Minitel service in New York and Los Angeles through Computer Sciences Corporation's Infonet.

- The international communications segment is heating up with:

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- IBM announcing intercontinental data processing services through links between its U.S.-based Information Network, the IBM World Trade Europe/Mid East/Africa Corporation, and IBM Japan.

- GEISCO announcing Trade*Express, an international Electronic Data Interchange service. IBM's and GEISCO's actions may put pressure on Computer Sciences Corporation's Infonet which is positioned as a network for multinational corporations but which does not (yet) offer EDI services.

- McDonnell Douglas and British Telecom forming EDINet Ltd. for services in the United Kingdom, with planning underway for services in the Far East.

- AT&T's Packet Service planning expansion to 20 international countries.

- In this highly competitive environment, it is difficult to see any opportunities made possible by unbundling remote computing services (RCS) networks, where most VANs (except Telenet) had their beginnings.

  - However, Wang has opened and expanded its internal packet network, called WangPac, and formed a subsidiary now offering network services. It will likely operate as a remote computing service in the future.

  - Also, troubled Western Union has entered the packet switching market fray through the network originally developed as EasyLink's backbone for electronic mail.

- Technologically, more protocols are being supported and dial up access to 2,400 bps ports has become widely available, with CSC providing 4,800 bps ports.

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- In 1986, most VANs enhanced their communications capabilities with SNA support, permitting users to link their terminals, micros, and mainframes via SDLC and 3270 protocols.

- New modems using error correction techniques are capable of speeds exceeding 9.6 Kbps on dial-up lines. VAN support for these higher speeds is expected, requiring capital expenditures.

- At year's end, several VANs joined with user organizations in lobbying efforts to prevent regulation of enhanced packet switched and protocol conversion services, as proposed by the Federal Communications Commission.

  - One alternative being considered would put VANs under regulatory restraints while allowing AT&T and the Bell Operating Companies to offer value-added services as part of basic services.

  - The proposal would redefine packet network services with protocol conversion as basic services, subjecting them to common carrier regulation by federal and, more troubling, state public utility commissions.

  - The protesting vendors and organizations fear such action would reduce competition, create regulatory burdens, and increase dial-up line access charges, an entirely unacceptable and business-threatening scenario.

- INPUT feels the FCC's proposals will be modified to permit continuing competition in the network services market while protecting the interests of current participants.

- Overall, the VAN market shows bright spots despite commodity pricing creating thin margins and low or no profitability.

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- In many cases, a vendor's VAN has been the delivery mode for other services and as such may have been viewed as a loss leader. VANs may have brought in business as part of the total vendor solution with profits generated by providing other services and/or information.

- However, INPUT observes the market's direction toward a focus on corporate links rather than providing access to traditional timeshared remote computing services which are being brought in-house by users. VANs are now providing specialized vertical market applications and transaction services.

- Industry consolidation will help the now stronger players, but uncertainty over the impact and opportunities of LADT services (clearly a long-term local telephone company strategy), coupled with increasing traffic volume, new applications, advancing technologies, and potential regulatory restrictions, means the industry will be anything but dull for its participants.

- Key VAN trends are summarized in Exhibit II-1.

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EXHIBIT II-1

VAN TRENDS

- Market Consolidation
- International Activities Increase
- Technological Improvements: Speeds, Protocols
- Corporate Links Emphasized
- Regulatory Threats

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III COMPETITIVE DEVELOPMENTS - VENDOR PROFILES

A. TELENET

1. BACKGROUND

- Telenet Communications Corporation (Reston, VA) is now part of U.S. Sprint, formed jointly by GTE and United Telecom. It consists of two formerly separate, and competing, VAN and long-distance networks.

- The first to use packet switching technology for public communications, Telenet was originally established in 1972 by Bolt, Beranek and Newman, Inc. (Cambridge, MA) and the original Telenet Communications Corporation, which was acquired by GTE in 1979.

- Publicly offered services began in 1975 as a "pure" communications service, unlike most VANs which were formed by unbundling communications from remote computing services.

- Telenet is the largest VAN by revenues, with access in approximately 370 U.S. cities and overseas connections in 55 nations through its own nodes and other facilities. By merging with United Telecom's Uninet, the resulting VAN strengthens Telenet's market dominance.

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- The company has offered former Uninet customers to continue the Uninet billing formats until July 1987 due to customer dissatisfaction with Telenet billing structures.

2. SERVICES

- Telenet provides access to Telemail E-mail services, with hard copy options and direct connections to Telecom Canada's Envoy, the first link between public electronic mail systems.

- Telenet also supports the Medical Information Network in association with the American Medical Association and the Phycom pharmaceutical products data base developed by Fisher-Stevens, Inc.

- Other applications are the Financial Information Network, Micro-Fone II credit transaction services for which GTE provides terminals, and PC SUNet for downloading software to IBM PCs and compatibles.

- In 1986, Telenet and Contemporary Group announced plans to provide a national paging service called Megamessage, with Telenet serving as the backbone transmission carrier.

- INPUT anticipates that Telenet will offer EDI services in 1987, and it has been promoting its electronic mail service for EDI-like applications.

- In addition to VAN services, the company provides dedicated private networks for government agencies, multinational corporations, and foreign governments and has transaction pricing available for credit card and other burst mode applications.

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3. FINANCIALS

- Telenet has been profitable since 1983, although revenues are not separately reported by U.S. Sprint or earlier by GTE.

- Estimated 1986 revenues are in the $180-200 million range, reflecting the merger of Uninet into Telenet.

B. TYMNET

1. BACKGROUND

- The McDonnell Douglas Information Systems Group (ISG) was created in April 1984 consolidating three McDonnell Douglas divisions and the newly acquired Tymshare, Inc. subsidiary (with the Tymnet VAN). McDonnell Douglas' acquisition of Tymshare was completed in March 1984 for approximately $312.7 million.

- Tymnet was originally formed due to demand for network services from Tymshare's remote computing service clients. It is the second largest VAN.

- The major portion of Tymnet is now called McDonnell Douglas Network Systems Company, although EDI and vertical industry services form their own companies within the group, sharing facilities and services as appropriate.

- Tymnet serves approximately 50 countries and over 500 U.S. cities. International access is supported via International Record Carriers (IRCs); however, the company's majority ownership of FTCC (an IRC) was recently sold to a unit of Pacific Telecom.

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2. SERVICES

- The group provides services to vertical and horizontal businesses through focused operating groups and also sells products and services to other ISG companies.

- Among services Tymnet provides are:

  - Check verification services.

  - Credit card authorizations.

  - Electronic data interchange.

  - VAN services for a variety of applications and customers.

- Tymnet also supports the OnTyme family of E-mail services, asynch, bisynch, and SDLC (3270) protocol access, and the X.PC error correcting protocol, with protocol conversions offered as part of the value-added service.

- Tymnet has an agreement with the Southern New England Telephone (SNET) company to provide access to its long-haul network from SNET's intraLATA packet network called ConnNet.

- Tymnet DTS, Inc., a subsidiary of the Network Systems Company, provides microwave digital termination services in several cities. This unit is believed to be for sale.

- Introduced in 1986, Tymnet's Tymstar Ku-band satellite network uses four-foot diameter earth stations, with transmission speeds up to 96 Kbps and receiving capabilities at T-1 carrier rates.

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- Each earth station communicates with a shared master hub earth station, operated by Tymnet, or with one purchased by the user.

- Tymstar service uses Tymnet's existing packet switching technology and earth stations manufactured by Satellite Technology Management, Inc. (Torrance, CA).

3. FINANCIALS

- Prior to its acquisition and the 1985 blending of Tymshare's operations into various ISG operating group companies, Tymshare had revenue of nearly $300 million and 1983 net losses of $1.6 million.

- In fiscal year 1985, ISG reported nearly $110 million in losses on revenues of $1.1 billion (an increase of 13%) due to industry sluggishness and adjustments for corporate reorganizations. In response, plans for new services were delayed and the group closed a manufacturing operation, named new executives, and laid off workers.

  - Irrespective of group losses, Tymnet's business grew nearly 30% in 1985.

  - However, for the first three quarters of 1986, ISG reported continuing losses of over $75 million.

- INPUT estimates Tymnet's 1986 revenues in the $115-125 million range.

C. GENERAL ELECTRIC INFORMATION SERVICES COMPANY (GEISCO)

1. BACKGROUND

- GEISCO (Rockville, MD), established in 1984, is a division of General Electric. It provides the Mark*Net VAN, available in over 750 cities

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worldwide with 600 access points in the U.S., representing the world's largest commercial teleprocessing network.

2. SERVICES

- GEISCO offers a broadly based service, with applications supporting international commodities, securities and currency markets, and international banking. Other industries served include manufacturing, shipping, retail, health care, and computer hobbyists.

- GEISCO's network provides access to a variety of processing services including its national clearinghouse for health care insurance claims, financial institution automated clearinghouse services, payment systems, and computer conferencing.

- The electronic mail service, called Quik-Comm, includes WPXchange, a storage and retrieval capability linked to the E-mail service, featuring word processing and document translations between incompatible computer hardware.

- The Mark 3000 remote computing service is IBM mainframe-based, but offerings in the Mark III service are more broadly based.

- GEISCO's strategic plan is to leverage the worldwide network presence and to focus on cross-industry applications, including EDI, business logistics, and international trade.

- It is also targetting vertical markets including banks, transportation, health care, and discrete manufacturers.

  - EDI services are provided through EDI*Express and Trade*Express, which supports international trading. The company has signed with several banks (including First Chicago) for international trade payment services.

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- With its EDI service, the company is intent on signing with agents to sell its services along with industry-specific software and hardware.

  - For example, Apparel Computer Company, American Business Computer (selling primarily to the auto industry), and MSA have agreements with GEISCO.

  - MSA is integrating EDI software purchased from Tronsettlements (Atlanta, GA) into its mainframe accounting and inventory management packages.

- GEISCO has invested an estimated $15 million and the skills of approximately 150 professionals in EDI, focusing individuals on specific industry segments.

- EDI services are sold in a "ramp up" process which sells to the largest members of a trading group, then uses telemarketing to sign smaller accounts in the group.

- GEISCO abandoned a plan to offer national automated clearinghouse services (ACH) primarily due to lagging ACH volumes and competition from the Federal Reserve Bank. However, GEISCO does support a regional ACH in California.

- In 1985, the company announced the GEnie consumer information service for microcomputer users, with low cost hourly rates, access to electronic bulletin boards, software libraries, electronic newsletters, and games.

- In 1986, the company added support for 3270 SNA/SDLC protocols, in addition to existing synchronous and bisynchronous service, through Mark*Net, to the company's IBM-oriented Mark 3000 RCS services.

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- GEISCO's philosophy is that the company will not enter any business where it cannot achieve a dominant or near dominant position. Rather than solely providing basic network services, such as electronic mail, GEISCO is positioning to leverage its data transmission, remote processing, and industry-specific applications in targetted markets.

3. FINANCIALS

- In 1984, the company spent $20 million upgrading equipment, spending another $8 million in 1985.

- As did many information service companies, GEISCO experienced difficulties during 1985, resulting in staff cutbacks.

  - The company announced the cutbacks were part of a restructuring leading to a tighter business focus.

  - Company officials acknowledge that network-based services contributed only 10% to the business. However, company officials established a 1986 goal of increasing the contribution of network services to 20%.

- INPUT estimates 1986 revenues in the $40-50 million range.

D. COMPUTER SCIENCES CORPORATION (CSC)

1. BACKGROUND

- CSC (El Segundo, CA), founded in 1959, is the largest independent professional services company in the industry, providing systems engineering and development, communications engineering, facilities management, and processing/network services.

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- CSC was one of the first remote computing service vendors and now provides a range of services in domestic, international, and governmental markets. The vendor's value-added network (Infonet) is oriented toward multinational corporations.

- CSC entered the VAN network services market in August 1983 through its Infonet subsidiary, which is part of the company's Information Network Services Group.

  - Infonet currently serves approximately 400 international cities, with links in 19 nations through dedicated lines and in 51 additional countries served via IRC connections.

  - CSC's positioning as an international VAN is strengthed by a stated commitment to local support by CSC employees (rather than agents) in major industrialized nations.

- The group has been repositioned into three major areas:

  - Value-added communications, with the network uncoupled from the company's host processors, allowing VAN services to be sold separately, with enhanced electronic mail (NOTICE) capabilities.

  - Professional services for AT&T and others.

  - Remote and distributed data processing using the company's IBM-based service.

- Company officials indicate there have been informal acquisition discussions. Possible suitors include automakers (excluding GM), DEC, and AT&T. While acquisition is not inconceivable, there is apparently little present interest in being acquired. An unfriendly takeover would likely be unsuccessful because

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much of the company's assets are its people. Any unfriendly takeover candidate must be careful to protect that asset base.

- Rather than be acquired, CSC officials indicate interest in buying firms with expertise in systems integration, health care, and/or financial services. In 1986, the company bought:

  - Computer Partners, Inc. (Waltham, MA), a small professional services firm with approximately $20 million in revenues which custom designs computing systems.

  - Comtec, Inc. (Farmington Hills, MI), an information systems supplier to health maintenance organizations with annual revenues of approximately $10 million.

2. SERVICES

- The company targets large multinational and multilocation organizations, including Fortune 1000 companies and communications, distribution, and manufacturing industries as well as federal and state agencies.

- CSC has relied heavily on government business and is working to expand its activities into more profitable commercial activities.

- Infonet's international profile serves well to differentiate its services, enhanced by CSC representatives versed in local languages, customs, and procedures in many landed countries.

- In 1986, CSC made several software and service announcements:

  - An agreement with Simware (Ontario, Canada) for software to allow micros to access mainframes through 327X protocols via Infonet.

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- A micro package called PC/Notice allowing ASCII or binary file transfers through the network's NOTICE electronic mail service.

- An agreement with Orion Software (Lexington, MA) for OrionNet service, permitting customers to link IBM System/34, 36, and 38 minicomputers through Infonet.

- The addition of SNA/SDLC and 3270 protocol support.

- The linking with the French Minitel videotex network to New York and Los Angeles.

- The company has been focusing its host computer services toward the federal government and growth markets in certain industries for remote processing and nationally available industry-specific applications. Examples include:

  - On-line inventory control.

  - Administrative information and software distribution between a software vendor's domestic headquarters and international offices.

  - Support of the U.S. Army's worldwide recruitment activities.

- Further, CSC's professional services in facilities management, system development, and integration are being leveraged in both domestic and international markets.

- The NOTICE E-mail service can link messages to a data base and provide form processing, information file transfer, and microcomputer-based electronic mail as well as telex access. CSC is believed to be investigating an adaptation of NOTICE for EDI applications.

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3. FINANCIALS

- CSC is rebounding from a multiyear slump. It has announced a goal of more profitable commercial activities accounting for one-half of its activities (rather than the current one-fourth) by the 1990s. This represents a shift in priorities from governmental contracts which are increasingly fixed-price and low profit.

- Fiscal year 1986 revenue for the company was $838.6 million, a 16% increase over the previous year. Pre-tax income was reported at $42.8 million, an increase of 36% (excluding one-time gains).

- In 1986, the Information Network Services Group accounted for 12% of the company's overall revenues or $100.3 million, with 48% from federal, state, and local governments; 39% from commercial activities; and 13% from international business. INPUT estimates VAN revenues in the $14-18 million range.

- The company expects as much as two-thirds of the group's revenue for fiscal 1987 will come from new communications and professional services introduced over the past several years.

- The company reported 1985 revenue for the Information Network Services Group of $92 million (down from 1984's figure on continuing operations of $95.2 million) but with a return to profitability.

- Historically, profit margins on Infonet were very high through 1981 but dropped as demands for timesharing eroded, leading to a loss in fiscal 1984, but rising in 1985 with an estimated profit margin of 3%.

- Earlier, the company established a 10-12% profit margin goal for the group, with growth on the order of 15%. The plan is to accomplish this through cost containment measures, successful marketing of new products and services, consolidation of equipment and facilities, and group function restructuring.

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E. IBM'S INFORMATION NETWORK (IN)

1. BACKGROUND

- The Information Network (IN) was formed in 1982 as an independent business unit (IBU) within IBM offering SNA networking and remote processing services.

- IN was upgraded in 1985 with new computer center facilities and other measures designed to improve large users' abilities to connect their SNA networks, use network-based applications, and link with other customers.

- Earlier, IN was available in a few U.S. cities representing a majority of its large mainframe customer installations, but now dial-up access is possible in over 100 cities.

- IN also connects to Telenet for additional access.

2. SERVICES

- Two services are supported on IN:

  - Network Services, for linking a customer's mainframes and terminals in a managed network environment.

  - Information Exchange, which provides "store and forward" and other value-added services.

- The target markets for IBM's Information Network are best described as "dedicated IBM shops" with users in electronics (mostly IBM and suppliers), textiles, insurance, and telecommunications.

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- In 1986, IBM announced Intercontinental Information Services to link transnational offices in the U.S., Asia, Europe, Africa, and the Middle East with data processing, office system, and file transfer services.

- IBM appears to be placing more attention on EDI services.

  - In late 1986, IN began distributing EDI software from Metro Mark, Inc. (Roslyn Heights, NY) and American Business Computer, Inc. (Farmington Hills, MI).

  - IN hosts Ad/TRACs (Advanced Transaction Rearrange and Conversion System) from Advanced Technology Systems (Norcross, GA) for EDI translations.

- INPUT believes the company's largest EDI users continue to be units of the parent firm and its suppliers.

- IN's Insurance Communications Service, selected by the Insurance Research Institute (IRI) to perform protocol conversions for up to 70 types of terminals and processors of independent insurance agents and corporate underwriters, also provides message switching and processing at volume discounts.

  - The Insurance Value Added Network Service (IVANS), operated by a separate company established by IRI, uses IBM's service supplemented with customized facilities and supervisory and support services.

  - Independent insurance agents can directly access a carrier's computers.

  - Approximately 40 insurance company host computers are connected to IVANS, serving over 3,000 independent agents.

  - IVANS is not believed profitable.

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3. FINANCIALS

- Company representatives indicate that the network business doubled in 1985, and access charge price cuts were implemented in August 1986 to further encourage use.

- INPUT estimates 1985 total revenue for the Information Network in the $60-$100 million range. Estimates for 1986 total revenue are in the $80-120 million range, with noncaptive VAN services accounting for approximately $10-20 million in user expenditures.

F. COMPUSERVE INCORPORATED

1. BACKGROUND

- CompuServe (Columbus, OH), formed in 1969, was acquired by H&R Block, Inc. in 1980.

- Services are oriented to both consumer and commercial accounts. Its target markets are hobbyists, the financial community, and POS credit card processing firms (VISA and seven others). Transaction processing in 1985 is said to have increased 25 times over 1984 volume (to 4.2 million transactions monthly), becoming one of the fastest growing company activities.

- CompuServe's Network Services is a VAN available to corporations, government agencies, and financial institutions with access in over 200 U.S. cities and in 196 countries via IRC gateways. Additional access is possible through other VANs.

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2. SERVICES

- Offered services include electronic mail, on-line data bases, shopping services, airline ticket reservations (via TWA's PARS system), and financial services including economic analysis, discount securities trading, home banking, and international funds transfer for overseas credit union members.

- CompuServe entered the point-of-sale (POS) information market in an agreement with VISA to provide computerized support for retail credit authorization and verification of charge card sales. Similiar agreements were signed with other private credit issuers.

- The EasyPlex (consumer) and Infoplex (business) electronic mail services and MCIMail were linked in early 1986 in the first U.S. connection between E-mail systems. Infoplex is used by approximately 150 Fortune 1000 companies.

- CompuServe has an exclusive agreement with two Japanese firms (Fujitsu and Nissho Iwai) to provide international services between Japan and the U.S., such as financial market information exchanges, positioning the company for further overseas activities.

- In 1986, the company announced its intention to buy SC-30M computer systems from Systems Concepts to meet anticipating mainframe processing and capacity demands resulting from business growth. These systems will be compatible with its current DEC processors.

- CompuServe has made known its desire to acquire companies offering new skills and technologies which will strengthen existing businesses.

  - Candidates may be service businesses providing on-line communications (E-mail and/or private, customized information services), data bases, shopping services, POS communication services, health care eligibility verification services, or facilities management companies.

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- It is also interested in OEM relationships fostering sales to Fortune 1000 and major financial institutions.

- Targetted markets include: investment banking, pharmaceuticals/chemicals, retail, restaurants, and high technology firms.

- The company has established a goal of increasing the current subscriber base of approximately 300,000 to 1 million within three years by adding additional services, using new marketing strategies, entering joint ventures with other companies, and adding business subscribers.

- CompuServe is moving away from computing services by forming private networks to provide business customers with access to specialized data bases.

- Several additional products are being considered by CompuServe to fill niches. Examples include weather forecasts which are currently offered to private pilots, graphic videotex services, and EDI services.

3. FINANCIALS

- Fiscal 1986 revenue totaled nearly $85 million, an increase of 23.4% from the previous year, with $10 million in pretax earnings, an increase of nearly 40%.

  - Approximately one-half of its revenues are from remote computing services.

  - Communications services accounted for an estimated $8 million in annual revenue.

  - The balance of the company's revenues are derived from data base access and other services.

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- Revenues for the third quarter ending January 31, 1986 were $21.5 million, an increase of nearly 22% from the same period one year earlier. Revenues for the nine-month period increased 26% to $62.4 million.

- Fiscal 1985 revenue totaled nearly $69 million, an increase of 33% from the previous year with nearly $8 million in profits.

- Parent company H&R Block reported 1986 fiscal year revenue of $606.7 million and net earnings of $60.1 million. Owner H&R Block earlier rejected an offer by a former company official to buy CompuServe. While the parent company has experienced losses in several quarters, its subsidiary is returning a respectable, and needed, profit.

- CompuServe has approximately 750 employees and claims more than 200 large corporate users in addition to individual service subscribers.

G. AT&T

1. ACCUNET PACKET SERVICE/REDIACCESS

- AT&T's Accunet Packet Service was orignally the backbone for AT&T's Information System's Net 1000, which was discontinued in June 1986. It was formerly known as the Basic Packet Switching Service and required customers to install dedicated trunks to shared network switches. Now, several access options are offered.

- Accunet Packet Service is available in 99 U.S. cities. By itself, the network does not fit the definition of value-added network, principally because of current regulatory restrictions on protocol conversion.

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- The offering is billed as a basic service, supporting X.25 traffic from the customer into the network.

- Data Termination Equipment (DTE), data circuit terminating equipment (DCE), and packet assembly/disassembly equipment (PAD) are the customer's responsibility, as are links to the service.

- However, through a joint offering with Control Data Corporation (CDC), RediAccess service increases access points to 150 locations and adds multi-protocol (asynch/bisynch/synchronous) support through CDC which provides PAD equipment. Accunet facilities are used by CDC for the Redinet EDI service.

- Further, access is possible through five local exchange carrier (LEC) local access data transport (LADT) networks which provide asynchronous to X.25 conversion as part of the offering. In addition, access may be gained through other value-added networks.

- There is no holding time charge for domestic use. Customers are billed only for actual data kilopackets sent and received. International service does carry a holding time charge. There is also a fixed monthly charge for a customer's dedicated ports.

- Plans for Accunet Packet Service call for expansion from the 13 international interconnections to a total of 20 such links and connections with five local area public data networks (LADTs) operated by LECs. In the future, per call billing, customer network management, and additional access will be supported as needs arise.

2. THE CANCELLATION OF AT&T's NET 1000

- In January 1986, AT&T Communications announced it would withdraw its value-added packet switched/remote computing service called Net 1000

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effective June 1986. The network was not meeting profit objectives, with 1984 estimated revenues under $3 million and 1985 not showing any improvement as customers left the service.

- There were difficulties in developing NET 1000. It was originally introduced as Advanced Communications Systems in 1978 and was reintroduced in 1983. The original design was modified to rely on existing IBM and DEC computers rather than use Western Electric processors which were delayed in development.

- Primary services available on Net 1000 were mortgage information, an electronic data interchange (EDI) service, and an automotive supply inventory service.

- AT&T had asked for FCC approval to offer the EDI Information Interchange services in conjunction with ATT Information Systems, saying discontinuation was possible. However company officials denied the closing was due to unfavorable FCC reaction to this and other proposals.

- Net 1000 was directed at a different market than traditional VANS and had broader capabilities. The idea was to provide a comprehensive, compatible network of networks connecting various corporate private networks and supporting any combination of computers.

  - Customers could load data bases and Cobol-like applications written in the "C" language on network node computers using store and forward services and tying their own processors to the network.

  - Net 1000 was a dual mode intelligent network which overlayed an on-line application-oriented processing service on a foundation of a transparent network.

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- The original perceived need for the combined network and RCS service was not cost-effective for many users and not needed for others.

  - Customers preferred to install applications on their own processors. Much of the processing AT&T intended to provide can now be done on microcomputers.

  - The cost of using NET 1000 for communications alone versus private or other packet networks was not justifiable.

- In addition to these factors, AT&T had marketing problems. Rival firms told INPUT that the company failed to follow through in competitive bidding situations.

- Further, IBM mainframe users perceived that IBM's Information Network, with its SNA backbone, was more trustworthy than Net 1000 which supported any combination of computers. IBM was seen as having more SNA expertise.

- AT&T will remain active in the VAN market.

  - Barring unforeseen events, it will maintain EDI presence through a relationship with Control Data's Redinet which uses Accunet facilities.

  - With CDC, multiprotocol support is provided on Accunet in the RediAccess service.

3. AT&T's T-SERVICES

- In April 1986, AT&T Information Systems announced it was opening its private packet switched network to others in support of a new point-of-sale network called AT&T Transaction Services or T-Services.

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- T-Services provides customer network control, protocol conversion, and preprocessing for POS network vendors, offloading the customer's host computers.

- Access was originally available in 90 locations throughout the U.S.

- CoreStates Financial Corportion, the holding company of the Philadelphia National Bank, is using T-Services for a POS system being constructed for the Sun Refining Company.

- T-Service charges are based on start-up fees, monthly charges, and usage fees.

- When permitted, AT&T may offer processing services similiar to those provided earlier through NET 1000 directly via its other network offerings.

H. GRAPHIC SCANNING CORPORATION/GRAPHNET

1. BACKGROUND

- Formed in 1968, Graphic Scanning Corporation (Teaneck, NJ) is involved in several communications services.

  - Prior to recent divestitures, it had cellular radio, paging, mobile telephone, telephone answering services, cable television, and direct broadcasting by satellite (DBS) interests as well as manufacturing operations.

  - Until late 1986, the company held a substantial interest in FundsNet, Inc. which provides electronic funds processing, funds transfer, credit card processing, and other services for the transportation and general

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business market. FundsNet was sold to National Business Systems, Inc. (Minneapolis, MN).

- Subsidiary Graphnet Inc. provides data communications and messaging services via a value-added network. Graphnet, begun in 1975, was optimized for switched, store and forward facsimile services which have since been expanded with a variety of services.

2. SERVICES

- Graphnet services include:
  - The Freedom Network, a global packet switching service for messaging, supporting communications among a variety of equipment domestically, and telexing devices internationally.
  - Freedom Express, which provides electronic, courier, and telephone voice delivery as well as electronic mailboxing.
  - Freedom Forward, a store and forward service supporting the Freedom Express E-mail service.
  - Support for a telegram service and the telephoning of messages by subscribers to a service operator using a Freedom Network Gold Card for account billing.
  - Legal Net, connecting major law firms with the Securities and Exchange Commission and state securities commissions for sending and receiving messages and legal documents.
- Graphnet also provides specialized data and message processing for banks and their correspondents, industrial corporations, and government agencies. The Securities Services division provides communications and data base services to

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the legal, investment banking, and brokerage communities in connection with security underwriting and distribution.

- In 1986, Graphnet and British Telecom International announced a planned U.S./Great Britain telex service. Graphnet holds common carrier operating agreements in Argentina, Austria, Canada, Costa Rica, Hong Kong, Italy, Mexico, the Phillippines, and Portugal.

- Graphnet claims to transmit in excess of 500 million messages and data transactions annually for over 400,000 customers.

- The company's recent history has been controversial, involving shareholder relationships, certain FCC applications for paging services, and the potential sale of assets to company officials who would then leave the company. Complaints by a shareholder group and a planned proxy battle led to a new president being named.

- Subsequently, Graphic has entered negotiations with several firms, including SouthWestern Bell Telephone, to sell its interests in cellular radio licenses and generate needed capital to bring the company back to profitability.

3. FINANCIALS

- The company has had increasing revenues but also losses for the past three fiscal years.

  - As of September 30, 1985, it had a retained earnings deficit of $50 million.

  - The company recorded a loss of $11.9 million in the year ended June 30, 1985, despite the divestiture of its cellular radio operations which resulted in income of $22.6 million.

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- It had a net loss of $11.6 million for the six months ended December 31, 1985, compared with a net loss of $14.3 million the previous year.

- Selected financial information is shown below ($ thousands):

	1983	1984	1985
Total Revenue	107,400.4	124,483.9	155,573.1
Total Expenses	127,846.3	148,631.4	168,388.6
Net Income	-20,325.4	-25,285.5	-11,907.5

- Revenue from Graphnet's specialized data processing and record and data communications (which includes VAN services) in 1985 totalled approximately $30 million, an increase of nearly 11% from the previous year. However, the company had a 1985 loss from these services of over $8 million, continuing a pattern.

- Graphic Scanning has approximately 950 employees.

I. WESTERN UNION CORPORATION (WU)

1. BACKGROUND

- The pioneering Upper Saddle River (NJ) company is facing significant challenges including administrative and organizational problems which have developed over its long history.

- As a result of these problems, the company has reduced its work force by one-fifth, renegotiated new union contracts, reorganized its corporate structure,

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and sold certain assets (and will continue to do so), while focusing its efforts on its core business as a record carrier, electronic mail service vendor, and provider of private data networks.

- Western Union Corporation, a holding company formed in 1969 to allow WU to diversify into unregulated areas, is being merged with the primary subsidiary, Western Union Telegraph Company.

- In September 1986, Western Union announced approval by its Board to enter into a letter of intent for acqusition by an investor group consisting of Pacific Asset Holdings, a private financial services organization, and MDC Holdings, Inc., a publicly traded national homebuilder and financial services company.

- The company has seen erosion in its customer base for private data networks due to increasing charges by the local telephone companies for leased lines. WU is trying to move this traffic to its packet switched data network and is seeking to upgrade its current telex customers to electronic mail services.

2. SERVICES

- WU, through subsidiary corporations, offers a wide range of networking services including:

  - Telex, TWX, and Worldwide Telex.

  - EasyLink Electronic Mail Service, Mailgram, Telegram, and Cablegram services. Electronic mail services include volume mailing of computer-originated messages.

  - Long-distance services, formerly called Metrophone.

  - A voice mail resale business using Voice Mail International (Santa Clara, CA) services.

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- Special systems and services for voice, data, graphics, and broadcasting, as well as money transfer service.

- Intracompany private messaging via Infocom services.

- In late 1986, WU opened its internal Packet Transport Network or PTN-1 (which supports Easylink) to provide packet switching services for business customers. The network can also access EasyLink and data base services.

  - Additional access points are planned by mid-1987, bringing the total to 180 cities.

  - Both domestic and international services are planned with POS network services viewed as a primary opportunity.

  - Pricing will be a reported 10-15% lower than other VANs, partially due to local connections through the company's long-distance services and, eventually, through 800 IN-WATS service.

- The company also announced plans to introduce EDI services in 1987.

3. FINANCIALS

- Western Union sold its Government Systems unit to Continental Telecom's American Satellite Company for $155 million.

  - The unit provides federal agencies with data communications.

  - WU will provide maintenance and administrative services after the sale is finalized.

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- The Government Systems Division provides Safelink, a packet switched network for interactive timesharing and transactions with encryption features for government agencies.

- In 1984, WU posted a $58.4 million loss on revenue of $1.1 billion, and in 1984, reported a $370 million loss primarily due to a write-down on certain transmission and switching equipment. The write-down was part of a financial restructuring and a renegotiation process with its lending institutions.

  - The company's estimated debt is nearly $1 billion.

  - Its external auditors had qualified the 1984 and 1985 financial reports due to uncertainty over the availability of financing to meet debt obligations.

J. WANG INFORMATION SERVICES COMPANY (WISC)

1. BACKGROUND

- In June 1985, Wang Laboratories formed this subsidiary to leverage the company's technology and create an additional revenue source. The company's proprietary and internal WangPac packet switching network has been opened as a value-added network.

  - WangPac was developed with help from Bolt, Beranek and Newman, Inc. (Cambridge, MA).

  - WangPac plans call for 60 packet switching processors, many located in Wang district offices and international locations.

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- The network will offer services such as access to data bases and messaging services, gateways to other public data networks, and eventually RCS services with accounting and scientific applications running on Wang and IBM systems.

- WISC's initial offerings are nationally available voice mailbox services based on the DVX Digital Voice Exchange product and an electronic mail service with new portable terminals provided to subscribers.

- Incorporated into WISC, through acquisition, is Walsh Greenwood Company's assets in a subsidiary providing financial market data and analysis information to brokers and traders via telephone lines. The service is called "Shark."

- Wang also owns a subsidiary called Wang Communications, Inc. (Arlington, VA), which is a specialized common carrier.

  - In late 1985, Wang Communications was given permission by the California PUC to provide IntraLATA services in Los Angeles and San Francisco.

  - Wang Communications also has networks in the Boston, Philadelphia, and Chicago areas which extend across state lines.

- The company provides T-1 and higher capacity facilities using a combination of microwave, fiber optics, lightwave, and coaxial cables.

2. FINANCIALS

- After disappointing earnings leading to layoffs and a short manufacturing suspension, Wang Laboratories has been showing signs of recovery.

  - Wang's 1986 corporate revenue was $2.64 billion, an increase of 12%, with net earnings of $51 million, an increase of 228%.

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- These results were achieved through streamlining operations, controlling costs, and reducing expenses.

- In January 1987, Wang, saying it would report an operating loss of over $35 million for the second quarter ending December 31 due to weak sales, announced it would fire 1,000 workers and cut pay 6% for U.S. employees, replacing the lost salaries with stock of equal value.

- Aggressive revenue targets for WISC were established; however, INPUT believes revenues for WangPac are still low due to its relatively recent introduction.

K. MCI COMMUNICATIONS CORPORATION (MCI)

1. BACKGROUND

- MCI began as Microwave Communications, Inc. to provide short-haul communications links. These links became longer, and, overcoming AT&T's monopoly along the way, the company became the most successful inter-exchange carrier (IXC), operating its own microwave, fiber optic, and satellite network.

- The company, through its subsidiaries, provides various domestic and international services including voice, data, record, personal communications, and E-mail services.

- Services are provided to match, or better, similiar offerings from AT&T such as WATS-type bulk services.

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2. SERVICES

- MCI's DataTransport is a public packet network offering designed to compete with AT&T's Accunet. The service is directed to users spending $100,000 or more per month for data communications or who operate private networks of approximately 200 devices.

  - Service contracts are customized for each account, and points of presence are established in response to customer needs.

  - Connections with BOC packet networks are planned in order to save access charges for wide area networking.

  - The company is considering a strategic alliance with an equipment vendor to focus on selling private packet networks in a change of emphasis.

3. FINANCIALS

- In December 1986, MCI announced expected fourth-quarter charges of between $500 and $550 million, resulting in a sizable net loss for the year.

  - For the first three quarters in fiscal year 1986, MCI reported $2.67 billion in revenue and $54.1 million in net income.

  - In 1985, MCI reported revenue of $2.54 billion and net income of $113.3 million.

- The company's equipment write-downs are primarily related to the early 1986 acquisition of Satellite Business Systems from IBM in a complicated arrangement in which IBM purchased a portion of the company.

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- Another portion of the write-down is due to reorganization and severance pay for over 2,000 dismissed employees.

- Data Transport is reported to have only six large users. In January 1987 the company planned a new approach to improve sales by focusing on private network services, possibly in conjunction with a packet switch equipment vendor.

L. 1986 VAN VENDOR MARKET SHARES

- Estimated VAN 1986 market shares, based on user expenditures, are shown in Exhibit III-1.

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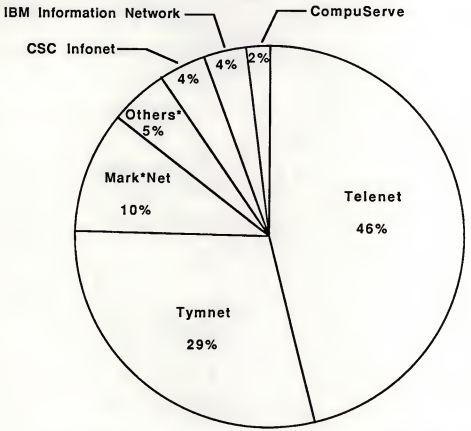
EXHIBIT III-1

VALUE-ADDED NETWORKS ESTIMATED MARKET SHARES, 1986
(Noncaptive User Expenditures)



*Includes: ADP's Autonet, AT&T's Accunet/RediAccess, Boeing Computer Services, Electronic Data Systems EDS-Net, and Graphic Scanning's Graphnet.

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IV CONCLUSIONS AND RECOMMENDATIONS

- VAN services are largely viewed by users as commodities. Available applications are often the only options leading users to choose one VAN over another. Geographical coverage has become less of an issue as networks have expanded.

- Pricing competition requires the general service VANs to find new ways of increasing their share of this growing market. As more players enter the field, maintaining market share will become more difficult, and the ability of new services to develop the critical mass needed for profitability will create significant challenges. The window of opportunity for new VAN services appears to be closing, although industry-specific services may find success.

- The "agent" approach used by GEISCO for EDI services is worth emulating by other carriers in EDI and other application areas, particularly those with a vertical industry focus.

  - By linking its communications services to the expertise of qualified processing, messaging, turnkey, or software vendors, a VAN can efficiently expand its market presence.

  - Of course, it is important to verify that the relationship with chosen agents is within the company's mission and will help meet its goals.

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- While VAN interconnections are occurring, there are different pricing approaches. Some vendors charge full price for internetwork links, treating the handoff as another network node and resulting in double charges for the user. Others share communications costs for internetwork communications.

- Critical interconnection issues need to be resolved, particularly for E-mail and EDI services. The X.400 E-mail and X12 EDI standards are directed toward internetwork compatibility which will result in increased network traffic due to improved utility.

- There is inherently little reason for a VAN not to offer EDI services. INPUT is projecting high growth rates for EDI. A vendor failing to provide EDI is missing an opportunity to participate in an area which addresses fundamental business needs. EDI will eventually become a utility/commodity service in its own right, and a firm without an offering may lose some of its current customers. Companies are now locking up industry-specific services; however, opportunities will increase as usage grows.

- Both competition and opportunity for VANs is coming as the local exchange carriers (LECs) implement local area data transport packet (LADT) network services. The LEC strategy is clearly a long-term one since only about 5% of VAN traffic terminates in the same LATA. However, through interconnections with wide area VANs, additional traffic results and new presence points are added with little capital outlay by the participating VAN.

- A long-term threat to VANs is the Integrated Services Digital Network (ISDN).

  - Although a number of technical and market issues remain to be resolved, ISDNs will eventually come into play, offering a full range of communications services, some of which will compete with VAN services. Examples include electronic messaging, on-line data base access, and transaction processing, with ISDN services overcoming equipment and protocol incompatibilities.

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- Existing VANs should monitor ISDN development and plan their responses. It may be desirable to initiate or demonstrate services which offer what ISDNs now only promise, including integrated voice, data, and image communications.

- Although growth rates are high, some VANs continue to operate unprofitably. This condition may be acceptable assuming the applications and data bases delivered through the VANs are profitable and if the VAN plays a strategic role in supporting the other services provided by the company.

- The high growth VAN areas are transaction related--EDI, POS, check verification/authorization. Other high growth areas are messaging and on-line data bases.

  - EDI use is embryonic but rapidly growing.

  - E-mail will grow as standards are set and accepted and as system interconnectivity increases.

  - OLDB will grow although the most used data bases are available through multiple outlets and are thus perceived as commodity services.

    . However, industry-specific data bases offer opportunities for differentiation.

    . Additionally, using EDI network traffic to create a unique data base is an opportunity worth investigating. Only one example can now be found, in Sterling Software's Ordernet Division's EDI services to the pharmaceutical industry.

- Vendors active in VAN services would be well served to secure control over the source data that is transmitted over the networks. The financial and

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marketing leverage is greatest for the data owner--the network owner will evenutally be squeezed by alternate delivery methods (such as CD-ROM) and other network service vendors.

- Despite the forecast five-year period of strong growth, this recommendation for 1987 may appear premature. However, it is advisable for VAN vendors to allocate some of their profits to securing future control over network data, which represents higher margins, rather than expecting the projected growth rate to continue indefinitely.

- Private networks will increasingly be demanded, and although they compete with public VAN services, VANs can participate through selling packet network switches and providing facilities and professional services supporting private networks.

  - Vendors should therefore enhance their professional services activities not only domestically but also internationally, particularly in countries which are developing communications infrastructures and value-added networks.

  - International activities will extend the life cycles of existing technologies and position vendors for improving the international capabilities, and use, of their networks, applications, and data bases.

- Industry consolidation will likely continue. VANs should continue to evaluate firms which will add to their company's business or which can open large new markets meeting corporate goals and objectives.

- Technological improvements are one way to maintain a competitive edge. There may be opportunities to merge voice and data communications as packetized voice developments continue. Higher speed links accommodating new high-speed modems and cost-effective VSAT services are ways a VAN can expand its traditional services.

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- Consumer applications may be the riskiest area, as the U.S. videotex experience has demonstrated.

  - In the long term, when the BOCs and AT&T are free to offer information services, electronic consumer information and services may yet become a substantial opportunity.

  - VANs will have a role to play in interLATA transport of videotex information, but must plan their participation through new relationships with the LECs and continuing relationships with information providers.

- New applications delivered by VANs will continue to develop. Although the market opportunities represented remain to be proven, adaptations of work-at-home ("telecommuting") applications may be of interest in some industry segments.

- Proposed regulatory actions which threaten the heart of VAN services will likely fail, but the directions appear clear--more competition is coming, and innovative approaches, coupled with services which meet user needs in a cost-effective and timely manner, are the avenues to survivability and market success.

- Exhibit IV-1 summarizes INPUT's recommendations to value-added network vendors.

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VAN RECOMMENDATIONS

- Look for Strategic Partners
- Resolve Internetwork Pricing Issues
- Offer EDI
- Link with LEC LADTS
- Demonstrate ISDN-Type Services
- High-Growth Areas: Transactions, Messaging, Data Bases
- Offer Professional Services Supporting Private Networks and International Activities

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APPENDIX VA-A: FORECAST RECONCILIATION

- Exhibit VA-A-1 shows the reconciliation between INPUT's 1985 forecast and the current forecast for end-user expenditures for value-added network services.
  - The size of the 1985 market has been reduced by $60 million, or 19%.
  - The forecast for the 1990 market has been reduced by $155 million, or 14%.
- These changes were required for three reasons:
  - INPUT defines VANs solely as communications services. To fit this definition, any "processing" must be solely related to communications--switching, store-and-forward, protocol, and code and speed conversions. These user expenditures are in addition to dial-up and leased line costs to a network node.
    - In some cases, applications-related processing fees and fees paid for data base access were improperly categorized in the earlier market sizing.
    - Since communications costs are often bundled into these expenses, INPUT has estimated the portion of application and data base fees paid by users which can be properly associated with transport/communications services.

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EXHIBIT VA-A-1

DATA BASE RECONCILIATION OF VALUE-ADDED NETWORK USER EXPENDITURE FORECAST

1985 Market			1990 Market			1985-1990 AAGR Forecast in 1985 Report (Percent)	1986-1991 AAGR Forecast in 1986 Report (Percent)
1985 Forecast ($ Millions)	1986 Report ($ Millions)	Variance as Percent of 1986 Report	1985 Forecast ($ Millions)	1986 Forecast ($ Millions)	Variance as Percent of 1986 Report		
$368	$308	19%	$1,270	$1,115	14%	28%	28%

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- An adjustment was necessary due to the double counting error which occurs when, for example, an information provider pays a VAN for providing access to data bases and the end user pays the information provider one fee for both communications and data base access. In this case, the information provider is the user.

- VANs often charge fees associated with providing services to end users and for internal use to other corporate units. In the latter case, this revenue is captive, and in the former case, end users pay fees which include the VAN service. Accounting for this situation necessitates a further adjustment to the forecast and market estimate sizes.

- The AAGR forecasts for 1985-1990 and 1986-1991 remain constant at 28%.

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APPENDIX VA-B: DEFINITIONS OF TERMS

- BOC - Bell Operating Company (also see LEC).

- CD ROM - An optically-encoded "read only memory" disk with high capacity, similiar to compact disks holding music, but generally containing data.

- CCITT - The International Consultative Committee on Telephone and Telegraph, a U.N.-chartered standards setting agency, part of the International Telecommunications Union.

- DCE - Data Circuit Terminating Equipment. Communications equipment such as modems and multiplexers which connects DTE to the network. In a value-added network, usually describes equipment at the packet switching node or access point.

- DTE - Data Termination Equipment. User devices such as computers or terminals which receive or transmit data located at either end of a data network but connected to the network by DCE.

- Electronic Mail ("E-mail") - The use of telecommunications to distribute messages between individuals. May be a computer-based message system (CBMS), facsimile (FAX), or voice store and forward (voice mail).

- EDI - Electronic Data Interchange. The computer-to-computer exchange, often through a third-party network processing service, of data representing

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electronic business documents. The computers may have different protocols and the documents may be in different formats. Sometimes called Electronic Business Data Interchange (EBDI).

- EFT - Electronic Funds Transfer. The transmission of data representing monetary value between entities.

- InterLATA - Communications between designated areas called LATAs (see definition below).

- IntraLATA - Communications within LATAs.

- IRC - International Record Carrier, providing "records" such as telex messages and leased line service both domestically and internationally.

- ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image using a standard interface and twisted pair wiring.

- IVANS - The Insurance Value Added Network, provided on IBM's Information Network.

- IXC - Inter-Exchange Carrier, a long-distance provider. Sometimes called Other Common Carrier (OCC).

- LADT - Local Area Data Transport. Packetized data communications provided by the BOCs within local access transport areas (LATA).

- LATA - Local Access and Transport Area, where communications are generally handled by the local telco.

- LEC - Local Exchange Carrier. A Bell Operating Company (BOC) or an independent telephone company which provides intraLATA services.

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- NACHA - National Automated Clearinghouse Association, a banking services industry group.

- On-Line Data Base (OLDB) - Data bases available for interactive access through vendor or common carrier networks.

- Packet Switching - A shared channel data transmission technique which formats information within data "envelopes" called packets, each containing control information for routing, sequencing, and error correction (also see VANs).

- PAD - Packet Assembly/Disassembly equipment. Network equipment which allows multiple asynch and/or synch or host computers to link to a packet network by converting user protocols to X.25 standards for network transmission.

- POS - Point of Sale. A system which issues credit/debit card and/or checking account verification/authorization for retail transactions using magnetic card readers (often integrated with electronic cash registers) which accesses a service provider via a network.

- RBOC - Regional Bell Operating Company. One of seven holding companies coordinating the activities of the BOCs.

- RCS - Remote Computing Services.

- SNA - Systems Network Architecture. An IBM standard for mainframe computer communications.

- T-1 - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices and now used for microwave, satellite, fiber optics, or other bypass applications.

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- Telco - Telephone Company.

- Value Added Network (VAN) - A carrier which augments network transmission with computerized (usually packet) switching and other features such as store and forward, multiple terminal access, error detection and correction, and host computer interfacing.

- Videotex - An information distribution system characterized by displayed graphics and an easy user interface.

- VSAT - Very Small Aperature Terminal. A small satellite dish system, usually using Ku-band frequencies.

- X12 - Electronic data interchange standards administered by the American National Standards Institute (ANSI).

- X.25 - The CCITT interface standard for packet switched networks.

- X.75 - The CCITT interface standard for connection between packet switched networks.

- X.400 - The electronic mail standards established by the CCITT.

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